Fourteenth Annual

RESEARCH REPORT

NORTH CENTRAL

WEED CONTROL CONFERENCE

1957

Des Moines, Iowa

December 10, 11 and 12

This report includes brief summaries of weed control studies conducted in 1957 in the north central states of the United States and in the four inland provinces of Canada. While many of the experiments reported are not completed, it is hoped that these preliminary reports will be useful in providing leads for further research. This is especially true of results with new herbicides or new uses for established herbicides.

This report is not intended to supplant full publication of research findings in established journals.

This Research Report has resulted from the cooperative efforts of all those who contributed abstracts and of the Research Committee who assembled the material, cut the stencils and submitted them promptly for mimeographing. Our thanks to all who have helped in the preparation of this report.

D. W. Staniforth, Vice Chairman
and E. K. Alban, Chairman
Research Committee of The North
Central Weed Control Conference

TABLE OF CONTENTS

Research Committee

Page

Indexes
- Author I
- New Chemicals IV
- Herbaceous Weeds V
- Woody Plants VII
- Field Crops VIII
- Horticultural Crops IX

Control of Herbaceous Weeds
- Canada Thistle and Perennial Sow Thistle 1
- Field Bindweed 7
- Hoary Cresses and Bur Ragweed 10
- Leafy Spurge and Russian Knapweed 12
- Toadflax and Other Perennial Herbaceous Weeds 18
- Johnson and Bermuda Grass 32
- Quackgrass 35
- Annual, and Winter Annual Grass Weeds 45
- Annual, Winter Annual, and Biennial Broad-leaved Weeds 65

Control of Weeds in Field Crops
- Spring Sown Grain 76
- Fall Sown Grain and Sorghum 83
- Corn 86
- Flax 94
- Soybeans 96
- Forage Legumes 99
- Herbaceous Weeds in Pastures and Meadows 110
- Sugar Beets 112

Control of Weeds in Horticultural Crops
- Turf 114
- Field and Canning Peas 118
- Vegetable "Root" Crops 125
- Other Vegetables 132
- Fruits 141
- Ornamental Nurseries, Forest Nurseries, Shelterbelts and All Others 143

Brush and Woody Plant Control
- Brush on Rangeland and Pastures 149

Chemical Drying and Pre-harvest Weed Control 153

New Herbicides 155

Mechanical Considerations and Aerial Applications 158

Basic Studies in Botany, Ecology and Plant Physiology 162

Miscellaneous 169

RESEARCH COMMITTEE -- 1957

Chairman - E. K. Alban, Department of Horticulture
The Ohio State University, Columbus, Ohio

Vice Chairman - D. W. Staniforth, Department of Botany and
Plant Pathology, Iowa State College, Ames, Iowa

Project Summarizers --

Quackgrass ---------- K. P. Buchholtz, Department of Agronomy,
University of Wisconsin, Madison 6, Wisconsin

Johnson Grass and Bermuda Grass -- O. H. Fletchall, Field Crops Research Branch,
U.S.D.A. and University of Missouri, Columbia, Missouri

Canada Thistle and Perennial Sow Thistles -- C. J. Willard, Department of Agronomy
The Ohio State University, Columbus, Ohio

Leafy Spurge and Russian Knapweed --------- L. A. Derscheid, Agronomy Department,
South Dakota State College, College Station, Brookings, South Dakota

Field Bindweed ---------- W. M. Phillips, Field Crops Research Branch, U.S.D.A.,
and Kansas Agricultural Experiment Station, Hays, Kansas

Hoary Cresses and Bur Ragweed ----- P. F. Sand, Agronomy Department, University of
Nebraska, Lincoln 3, Nebraska

Toadflax and Other Perennial Herbaceous Weeds ---------- H. A. Friesen,
Dominion Experimental Station, Lacombe, Alberta, Canada

Annual and Winter Annual Grass Weeds ------- R. S. Dunham, Department of Agronomy
and Plant Genetics, University of Minnesota,
University Farm, St. Paul 1, Minnesota

Annual, Winter Annual and Biennial Broad-leaved Weeds ---------- Thor Kommedahl
Department of Plant Pathology and Botany, University
of Minnesota, University Farm, St. Paul 1, Minnesota

Spring Sown Grain ---------- W. J. Breakey, Dominion Experimental
Station, Morden, Manitoba, Canada

Fall Sown Grain and Sorghum ---------- L. E. Anderson, Agronomy Department,
Kansas State College, Manhattan, Kansas

Corn ---------- O. C. Lee, Botany and Plant Pathology,
Purdue University, Lafayette, Indiana

Flax ----------R. G. Robinson, Division of Agronomy and Plant
Genetics, University of Minnesota, University Farm,
St. Paul 1, Minnesota

Soybeans ---------- F. W. Slife, Agronomy Department,
University of Illinois, Urbana, Illinois

Forage Legumes ----- - ---------- ------- F. F. Sand, Agronomy Department,
University of Nebraska, Lincoln 3, Nebraska

Herbaceous Weeds in Pastures and Meadows ----- M. K. McCarty, Field Crops Research Branch, U.S.D.A. and Agronomy Department, University of Nebraska, Lincoln 3, Nebr.

Sugar Beets ---------- E. A. Helgeson, Department of Botany, North Dakota Agricultural College, Fargo, North Dakota

Turf ---------- O. C. Lee, Department of Botany and Plant Pathology, Purdue University, West Lafayette, Indiana

Field and Canning Peas ----------J. J. Sexsmith, Experiment Station, Lethbridge, Alberta, Canada

Onions, Potatoes, and Root Crops -------- R. E. Nylund, Department of Horticulture, University of Minnesota, St. Paul, Minnesota

Other Vegetables ---------- G. F. Warren, Department of Horticulture, Purdue University, Lafayette, Indiana

Flowers ----------J.P. Mahlstede, Department of Horticulture, Iowa State College, Ames, Iowa

Fruits ---------- D. D. Hemphill, Department of Horticulture, University of Missouri, Columbia, Missouri

Ornamental Nurseries, Forest Nurseries, Shelterbelts and All Others--J.P. Mahlstede, Department of Horticulture, Iowa State College, Ames, Iowa

Brush on Rangeland and Pastures -------- H. M. Elwell, Field Crops Research Branch, U.S.D.A. and Oklahoma Agricultural Experiment Station, Box 465, Guthrie, Oklahoma

Brush on Rights-of-way ---------- R. H. Beatty, Agricultural Chemicals Division, American Chemical Paint Company, Ambler, Penn.

Brush in Forests and Plantings ---------- H. L. Hansen, School of Forestry, University of Minnesota, University Farm St. Paul 1, Minnesota

Chemical Drying and Pre-harvest Weed Control--- Neal Shafer, Department of Agronomy, University of Nebraska, Lincoln 3, Nebraska

New Herbicides ---------- John Davidson, Dow Chemical Company, South Haven, Michigan

Mechanical Considerations and Aerial Applications ---------- W. G. Lovely, Department of Agricultural Engineering, Iowa State College, Ames, Iowa

Basic Studies in Botany, Ecology, and Plant Physiology --- W. E. Loomis, Botany and Plant Pathology, Iowa State College, Ames, Iowa

Canada Thistle and Perennial Sowthistle

C. J. Willard

Summary

Nine abstracts from five stations reporting 1957 work with these weeeds were submitted. All but one included ATA, which continued to give good results, better than any other herbicide. Treatment after growth was well started in the spring continued to give good results. Summer treatment of regrowth following mowing, plowing, or disking the first growth gave uniformly good results. Wetting agents did not increase effectiveness. Mixtures of 2,4-D with ATA were definitely inferior to ATA alone, no matter how applied. Diuron, Simazin and sulfuric acid in mixture with ATA were not helpful. Simazin, monouron, diuron, neburon and MCPB, alone, were more or less ineffective, none equalling ATA. High volume (not less than 20 gpa, usually more) should be used for ATA sprays. Some culture following ATA seems to be helpful. Perennial sowthistle was less affected by ATA than Canada thistle. ATA plowed under injured no crops following.

Abstracts

Amino triazole and Kuron on Canada thistle. Bondarenko, D. D. and Willard, C. J. Triplicate square-rod plots infested with Canada thistle were treated with amino triazole as follows: at 4, 8 and 12 lb/A in 80 gpa water May 10 (thistles two to ten in. high, plowed May 17 and planted to corn May 22); at the same rates May 21 also with wetting agents Vatsol and Dynawet at 5 ml. per 1½ gal. (4 to 20 in., 85 to 90 per cent at pre-bud to bud stage, 1.45 in. of rainfall occurred 12 hours after treatment, plowed June 11 and planted to soybeans the same day); and 2, 4, and 6 lb/A on May 27 (2 to 20 in. and 50 per cent at bud stage, fall plowed in 1956, disked April 26, 1957 and again for seedbed preparation prior to planting grain sorghum June 20), May 28 (4 to 30 in., 85 to 90 per cent at bud stage), June 4 (6 to 36 in., 95 to 100 per cent at bud stage), June 14 (10 to 40 in., late bud to early-bloom stage), and June 22 (20 to 40 in., full-bloom). Plots treated May 28, June 4, 14, and 22 were plowed August 8 and planted to winter wheat September 25. On October 11 all plots treated May 10, 21, and 27 indicated 96 to 100 per cent kill of thistles, regardless of rate or number of days between treatment and tillage. There was no difference due to wetting agents on May 21. On October 19, plots treated May 28 with ATA at 2, 4, and 6 lb/A indicated kills of 98, 99 and 99 per cent, respectively; treated June 4, 91, 96, and 98 per cent; June 14, 85, 98, and 96 per cent; and on June 22, 98 per cent at all rates. No crop showed amino triazole injury at any rate.

Amino triazole was applied at 2, 4, and 6 lb/A in 80 gpa water and Kuron (2-(2,4,5-trichlorophenoxy) propionic acid, as PGBE esters) at 2 and 3 lb/A in 40 gpa water July 29 on regrowth thistle 4 to 12 inches high in an alfalfa field mowed June 18. On October 1 the plots treated with ATA indicated kills of 96, 98, and 99 per cent at 2, 4, and 6 pounds, respectively; the plots

treated with Kuron indicated 7 per cent kill at 2 and 3 pounds. Both ATA and Kuron killed the alfalfa at all rates.

Observations in 1957 of plots reated with ATA in 1956 (Res. Rept. 1956, p. 2) indicated continued excellent results, 90 to 100% kill, at 6 and 8 lb/A applied May 5 and plowed May 28, at 2, 4, 6, and 8 lb/A applied May 21 and 28 and June 9 and plowed June 25, and at 2, 4, 6, 8, 12, and 16 lb/A applied July 10, 17, and 24 on regrowth thistles in an alfalfa field mowed June 9, whether plowed or not a month after treatment. (Contribution of the Ohio Agricultural Experiment Station).

Amino triazole in combination with 2,4-D, Simazin, and sulfuric acid on Canada thistle. Bondarenko, D. D. and Willard, C. J. All treatments in the following experiments were triplicated. In 1956, regrowth Canada thistle in a 3-year-old stand of birdsfoot trefoil, mowed on July 16 and 4 to 16 in. high, was treated September 7, 1956 with 4 and 8 lb/A ATA in 80 gpa water, and at 1, 2, 4, and 8 lb/A followed by 2,4-D amine at 1 lb/A in 40 gpa water 2, 24, or 48 hours later. Nothing more was done until the plots were plowed August 8, 1957, and winter wheat planted September 25. In a field mowed after oat harvest, regrowth thistle 2 to 10 inches high was treated September 7, 1956, with ATA at 4 and 8 lb/A in 80 gpa water. 2,4-D amine at 1 lb/A in 40 gpa water was applied one day later on one-half of these plots, and alone. The plots were plowed 19 days later and planted to winter wheat; nothing done in 1957 after wheat harvest. On October 19, 1957, the plots in the above experiments treated with ATA alone at 4 and 8 lb/A indicated kills of 92 and 94%; with ATA followed by 2,4-D, 60% or less; with 2,4-D alone, 10%.

Plots of Canada thistle 6 to 30 inches high at the pre-bud to bud stage were treated with ATA at 2 and 4 lb/A in 80 gpa water, Simazin at 2 lb/A, and a mixture of ATA and Simazin at 2 lb/A each on May 21, 1957. The plots were plowed June 11 and planted to corn the same day. On October 19, 1957, the plots treated with ATA at 2 and 4 lb/A indicated kills of 93 and 92%; ATA plus Simazin at 2 lb/A each, 77% Simazin alone at lb/A, 3%.

Simazin was applied at 4 and 8 lb/A in 80 gpa water on Canada thistle at full-bloom on June 22, 1957. The plots were plowed August 8 and planted to winter wheat September 25. On October 19 all plots indicated kills of 65 to 75% with essentially no difference between rates. ATA at 1 lb/A was applied in tap water and in 1M sulfuric acid in 80 gpa solution on Canada thistle 4 to 30 inches high and about 85% at bud on May 28, 1957. The ATA-H_2SO_4 solution killed all the leaves within a few days. The plots were plowed August 8 and planted to winter wheat September 25. On October 19, 1957, both ATA solutions indicated 37% kill.

In the above experiments birdsfoot trefoil was killed by ATA at all rates and was severely injured by 2,4-D. Wheat and corn were not injured by ATA or Simazin plowed under but additional observations will be made in 1958. (Contribution of the Ohio Agricultural Experiment Station).

Control of Canada thistle and perennial sowthistle in land being fallowed. Keys, C. H. and Forsberg, D. E. Fallow land, heavily infested with Canada thistle (Cirsium arvense) and perennial sowthistle (Sonchus spp.) was sprayed on July 13 when regrowth, following the initial fallow operation, had reached the pre-bud stage. The chemicals used included MCPA ester; MCPA amine; MCPB butyl ester; 2,4-D ester; 2,4-D amine at 2, 3 and 4 lb/A; ATA at 6, 8, 10 and 12 lb/A; and Neburon (1-N-butyl-3-(3,4-dichlorophenyl)-1-methylurea) at 4, 6, 8 and 12 lb/A. Neburon was ineffective regardless of rate. ATA provided complete kills and no regrowth at all rates. MCPB gave a high degree of control of Canada thistle, but there was considerable regrowth of sowthistle. There was virtually no difference in control between the ester and amine formulations of 2,4-D and MCPA. At the 2 lb/A rates the kills of both weeds approximated 85%, while the 4 lb/A rates approached 100% control. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Control of Canada thistle and perennial sowthistle in crop land. Keys, C. H. and Forsberg, D. E. An area of barley, grown on stubble land and heavily infested with a mixture of Canada thistle (Cirsium arvense) and perennial sowthistle (Sonchus spp.) was sprayed on July 2 using four rates of each of the following five chemicals: MCPA amine; MCPA ester; 2,4-D amine; 2,4-D ester; and MCPB butyl ester. The rates of each chemical were 8, 12, 16 and 24 ounces, acid equivalent, per acre. At the time of spraying weed growth ranged from seedlings to the pre-bud stage. Continued dry weather throughout most of July resulted in very poor crop growth and rather indifferent effects of the weed control treatments. From the weed counts it would appear that weather conditions provided some degree of control. Sowthistle was considerably more susceptible to the treatments than Canada thistle and, at the 24 oz. rates, control approached 100%. There were no instances where complete control was obtained. It was noted too that MCPB was not as effective as the other chemicals. Canada thistle exhibited considerable resistance to all treatments. The barley crop was so light and patchy that yields were not taken. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada)

Results of 1957 treatments for Canada thistle control. Ingle, M., Lee, O. C., Morre, D. J. Triplicated plots located in a bluegrass pasture in eastern Indiana were treated with a variety of chemicals at different growth stages. Survival counts were taken Aug. 17, 1957:

Date of application	Av. Height of thistle in.	Herbicide	Rate (active) lb/A	Plants/sq. ft. Av. no.
May 1, 1957	6	ATA	2	0.5
			4	0.5
		CET(Simazin)	4	2.7
			8	1.3
		Control		3.6
May 27	24	ATA	2	0.2
			4	1.5
		Control		5.6

(Continued)

Date of application	Av. Height of thistle in.	Herbicide	Rate (active) lb/A	Plants/sq. ft. Av. no.
June 14	36	ATA	2	0.7
			4	0.5
		Control		3.4

Addition of wetting agents to ATA gave variable results; in no case was there a significant improvement in control. (Dept. of Botany and Plant Path., Purdue University Agri. Expt. Sta., Lafayette, Indiana.)

Control of Canada thistle; 1957 regrowth after 1956 treatments. Lee, O. C., Ingle, M., Hart, R. D. A heavily infested bluegrass pasture in eastern Indiana was treated at various stages of growth in 1956 with ATA and combinations of ATA and diuron. May 6, 1957. Number of Canada thistle plants per sq. ft. on triplicated plots.

Date of application	Av. Height of thistle in.	Herbicide	Rate (active) lb/A	Plants/sq. ft. Av. no.
May 12, 1956	9	ATA	4	5.4
			6	3.4
		Control		6.6
May 22	18	ATA	4	1.4
			6	2.4
		Control		4.6
		ATA; diuron	0.5;1	2.2
			2;1	6.7
		Control		2.0
May 29	20	ATA	4	0.7
			6	0.4
		ATA (Liquid)	4	1.1
			6	0.5
		Control		3.9
June 6	26	ATA	4	0.1
			6	0.1
		Control		1.2
June 15	36	ATA	4	0.2
			6	0.2
		Control		2.0
July 24 (Mowed June 6)	12 (regrowth)	ATA	8	1.3
			12	0.6
			16	0.9
		Control		4.0
Part of the area was plowed in the spring of 1956, disced July 1, 1956, and treated during the fall of 1956. Counts as above:				
Sept. 14	10	ATA	4	2.2
			6	1.0
			8	0.6
		ATA; diuron	0.5;1	6.0
			2;1	2.3
		ATA; 2,4-D	4;1	2.8
			8;1	1.4
		Control		7.4

(Continued)

Date of application	Av. Height of thistle in.	Herbicide	Rate (active) lb/A	Plants/sq. ft. Av. no.
Oct. 19	18	ATA	4	3.7
			6	4.9
			8	3.5
		Monuron	4	3.6
			8	5.1
		Diuron	4	4.4
			8	5.5
		ATA; Monuron	2;1	6.3
		Control		5.9

(Contribution from Dept. of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana.)

The control of Canada thistle and sowthistle. McCurdy, E. V. A dense stand of Canada and sowthistle, growing in competition with a brome-alfalfa mixture, was treated with chemicals when the weeds were in the early flower stage. Amino triazole at 4 lb/A retarded regrowth but by early October a considerable number of new shoots were noted; at 8 lb/A very little regrowth occurred but it cannot be assumed all thistles were killed until observations are made next year; at 16 lb/A the chemical was no more effective but it caused much greater injury to the brome grass. The control of sowthistle was not as complete as Canada thistle. Amino triazole at the above 3 rates was combined with 8 oz/A of an ester of 2,4-D. The effect on Canada thistle did not appear to be any more permanent than when amino triazole was used alone. An ester of 2,4-D at 8 oz/A burned the tops of sowthistle and regrowth was strong but at 24 oz/A a large percentage of the sowthistle was killed. When amino triazole was applied at the above 3 rates all alfalfa was removed from the brome-alfalfa mixture. (Contributed by the Experimental Farm, Indian Head, Sask.)

Controlling Canada thistle with amino triazole, 1954-57. Pavlychenko, Th. K. Large solid infestations of Canada thistle (Cirsium arvense) both on idle land and in crop fields were treated at various points in Saskatchewan with amino triazole. Plots of 25 to 50 ft or more were used. From 1954 to 1956 only 2 stages of growth were studied, the advanced rosette and bud stages. In 1957 two more stages were added: full bloom and the rosette stage of the second growth. The treatments were varied as follows: I. single treatment, no cultivation; II. single treatment and cultivation; III. treatment, and retreatment if necessary at ½ the original rate plus second cultivation. The rates: 1½, 3, 6 and 9 lb/A in 60 or more gal/A of water.

Results: The single treatments at 1½ and 3 lb/A rates with no cultivation after the plants turned pale consistently produced some pale or green shoots at both rosette and bud stage. At the 6 and 9 lb/A rates with no cultivation some intensely discolored shoots were also recorded but usually these died back. In plots treated and cultivated when the top growth turned pale regrowth was rare even at the lower rates, especially at the bud stage. Retreatments and 2nd cultivations were occasionally

needed at the two lower rates. Treatments at the full bloom stage and then cultivated were somewhat erratic at the two lower rates. Those at the rosette stage of the second growth were highly effective at all rates where the first top growth was cut not later than the last week in July. The treated and then cultivated plots were free of regrowth until freeze up. These last results are for treatments made in 1957 and, therefore, should be regarded as preliminary. The final readings will be taken in 1958. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Sask.)

Effect of amino triazole on perennial sowthistle. 1955-57. Pavlychenko, Th. K. Perennial sowthistle in solid infestations or mixed solid patches with Canada thistle were treated in 1955, 1956 and 1957 with amino triazole at rates 1½, 3, 6 and 9 lb/A active in volumes of water from 5 to 60 gal/A. The first treatments were made the third week in June (advanced rosette stage) and the 2nd in the first week in July, when the sowthistle was in bloom and Canada thistle in the bud stage. Most of the locations used were slight depressions in large crop fields with heavy clay loam soils and good moisture. One series of treatments was left undisturbed after one application. The second similar series was cultivated once after the plants turned pale. The 3rd series was treated, cultivated and retreated. The 4th treated, cultivated, retreated at ½ the original rate and cultivated late in the fall.

Results: Perennial sowthistle in both solid and in mixed infestations with Canada thistle showed more resistance to amino triazole up to 6 lb/A rates. At 6 lb/A or higher rates both weeds were practically 100% killed and produced only very occasional shoots. Barley crop sown the following year was free of both weeds at 6 lb/A or higher rates, except the plots where less than 15 gal/A of water was used. In plots cultivated once or twice after the plants were intensely discolored considerably increased effectiveness of the chemical was observed and the 3 lb/A rates gave results almost equal to 6 lb/A rates on perennial sowthistle and much better on Canada thistle. 1½ lb/A rates were unsatisfactory on both weeds without cultivation, but quite effective on Canada thistle where two cultivations and retreatment at ½ the original rate was applied. For good results 3 lb/A with two cultivations seem to be the minimum for both weeds. In all cases a ghorough coverage with not less than 20 - 30 gal/A of water was highly important. It was observed also that in all plots where the perennial sowthistle was killed out, numerous seedlings came up toward the end of the season. Whereever these were not destroyed by late cultivation in the season of treatment, they produced perennial roots the next year and reinfested the area. (Contributed by Agricultural Division of American Chemical Paint Company, Saskatoon, Sask.)

FIELD BINDWEED

Summary

W. M. Phillips

Five abstracts were submitted. Two reports came from Kansas, two from Nebraska and one from Texas. All of the abstracts were concerned primarily with soil sterilant herbicides.

Workers in Kansas and Nebraska used mixtures of monuron and borates, and monuron, sodium chlorate and borates. In Kansas these mixtures appeared to be equal to sodium chlorate, provided slightly higher rates were used. Nebraska results indicated that sodium chlorate was somewhat more effective. A mixture of 2,4-D and borate gave good bindweed control in Nebraska, but the compound gave inconsistent results in Texas.

Excellent bindweed control was reported from Kansas and Nebraska following applications of certain chlorinated benzoic acid compounds. Several materials were tested and differences were noted. When applied at equal rates, 2,3,6-trichlorobenzoic acid was more effective than the polychlorinated benzoic acids.

Varying degrees of bindweed control were reported following treatment with sodium tetraborate, erbon, monuron, and high rates of 2,4-D and 2,4,5-TP. Ammate was not satisfactory.

In Texas, results obtained one year after application indicated that the season of the year or the number of irrigations did not appreciably affect the bindweed control obtained with soil sterilants.

Abstracts

Control of field bindweed. Bush, Dale A. and Krejci, Allan E. Triplicate square rod plots on field bindweed in a Hastings silt loam soil were treated on 14 November 1956 with 2,3,6-trichlorobenzoic acid at 20, 40, and 60 lbs./A; Erbon at 2 pts./sq. rd.; Ammate at 6 lbs./sq. rd.; DB Granular at 6 lbs./sq. rd. and Concentrated borascu at 16 lbs./sq. rd. Estimate of stand reduction was made on 2 October 1957. Concentrated borascu at 16 lbs./sq. rd., Erbon at 2 pts./sq. rd. and 2,3,6-trichlorobenzoic acid at 40 lbs./A. all showed 99 to 100 percent control. 2,3,6-trichlorobenzoic acid at 40 lbs./A. showed a 95 to 100 percent control and the 20 lbs./A. rate showed about a 95% control. DB Granular at 6 lbs./sq. rd. gave a 90 to 95 percent control. The Ammate plots showed little control. (Contribution of the Weed Division, Department of Agriculture and Inspection, Lincoln, Nebraska.)

Control of field bindweed (Convolvulus arvensis) with soil applications of herbicides. Nash, Russel L. A number of chemicals were applied to square-rod plots of field bindweed in October and November of 1956. This abstract is a summary of 4 locations in western Nebraska. Chemicals used were: DB Granular at 6, 8, and 10 lb./sq. rd.; sodium chlorate at 6, 7, 8, 10, and 12 lb./sq. rd.; Conc. Borascu at 12 and 15 lb./sq. rd.; Erbon at 120, 160, and 240 lb./A.; Ureabor and Chlorea at 5, 6, 7, and 8 lb./sq. rd.;

monuron at 40, 60, and 80 lb./A.; Ammate at 4, 5, and 6 lb./sq. rd.; Silvex at 20, 40, and 60 lb./A.; sodium salt of 2,3,6-trichlorobenzoic acid at 20, 30, 40, and 60 lb./A.; Polychlorobenzoic acid (80% TBA) at 30, 40, and 60 lb./A.; Polychlorobenzoic acid (ACP-M-103A) at 40 and 60 lb./A.; 2,4-D isooctyl ester at 40, 60, and 80 lb./A.; and 2,4-D Amine at 40, 60, and 80 lb./A. Of these chemicals, only Ammate was entirely unsatisfactory. DB Granular and sodium chlorate were about equal in effectiveness when used at the same rates and all rates, in general, were quite satisfactory. Conc. Borascu at the higher rate was effective at several locations. Erbon at all rates was effective at three locations. Ureabor and Chlorea were not as effective as DB Granular or sodium chlorate at any rates. Monuron was effective at the higher rates in several locations. Silvex at 60 lb./A. was effective at 1 location. 2,3,6-TBA was the most effective of the benzoics, followed by ACP-M-177 (80% TBA) and ACP-M-103A (Polychlorobenzoic acid) in that order. The 2,4-D formulations were inconsistent. The results of these demonstrations indicate that all chemicals except Ammate reduced the stand at least and DB Granular, sodium chlorate and the benzoic acids were the most consistent in eliminating field bindweed at the rates used. (Contributed by University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

Field bindweed control with mixtures of borate, borate-chlorate, and monuron. Phillips, W. M. Compounds composed of (1) 94% disodium tetraborate and 4% monuron, and (2) 57% sodium metaborate, 40% sodium chlorate, and 1% monuron have been used experimentally since May 1955. Both materials were applied in spring and fall at 6 and 8 lb. per square rod, (960 and 1,280 lb. per acre). Sodium chlorate at 6 lb. per square rod was included in all experiments. Applications were made to field bindweed growing on a medium heavy, silty clay loam. Soil moisture varied throughout the period, but, in general, drought conditions prevailed from 1955 until the spring of 1957. When applied at either 6 or 8 lb. per square rod the material containing 4% monuron consistently gave results which equaled or excelled the sodium chlorate treatment. Reductions in bindweed stand varied from approximately 80% to 99%. Average stand reduction of all sodium chlorate treatments was approximately 85%. When applied at 6 lb. per square rod the compound containing 1% monuron seldom reduced the stand of bindweed more than 50 to 60%. At 8 lb. per square rod the material was equal in effectiveness to 6 pounds of sodium chlorate. The length of time the soil will remain unproductive following the use of these chemicals has not been fully determined, but none of the treated plots supported sorghum growth during the 1957 growing season. Sorghum planted on the plots treated with sodium chlorate in 1955 grew slowly, but produced little or no grain in 1957. (Contributed by the Crops Research Division, ARS, USDA, and Ft. Hays Branch of Kans. Agr. Expt. Sta., Hays, Kans.)

Field bindweed control with polychlorinated benzoic acid. Phillips, W. M. Spring or mid-summer, and fall applications of chlorinated benzoic acid compounds were made to field bindweed in 1955, 1956 and 1957. Compounds consisting primarily of 2,3,6-trichlorobenzoic acid were used in all three years. Two additional materials, (1) a mixture of primarily 2,3,5-TBA; 2,3,6-TBA and 2,4,5-TBA and (2) a mixture of primarily dichloro, trichloro,

and tetrachlorobenzoic acids, [polychlorobenzoic acid (PBA)] were tested in 1956 and 1957. Differences were apparent in the results obtained with the various compounds. Nearly 100% control of bindweed was obtained on all plots treated with 24 lb. per acre, or more, of 2,3,6-TBA. At 15 lb. per acre this chemical reduced bindweed stands by approximately 80 to nearly 100%. Although less data are available, PBA used at equal rates, appeared to be considerably less effective than 2,3,6-TBA. Consistent results were not obtained following applications of 16 lb. per acre of the mixture. Many of the treated plots were still heavily infested with bindweed in the fall of 1957. Rates of 24 to 30 lb. per acre of PBA were approximately equal to 15 lb. of 2,3,6-TBA. Data available indicate that the mixed trichlorobenzoic acid was intermediate in effectiveness for field bindweed control. In 1957 grain sorghum was planted on all plots treated in 1955 and 1956. Forage was produced on all plots and most of the plants headed, but little or no grain was produced. (Contributed by the Crops Research Division, ARS, USDA, and Ft. Hays Branch of Kans. Agr. Expt. Sta., Hays, Kans.)

Soil sterilant application to bindweed under irrigated conditions. Wiese, A. F. and Rea, H. E. In order to determine if season of application or the number of irrigations has a bearing on the toxicity of soil sterilants applied in irrigated crops, several soil sterilants were applied to bindweed infested areas in growing sorghum on July 15, August 16, and September 13, 1955, and in a wheat field on April 5, May 4, and June 1, 1956. One 3-inch irrigation was applied to the experimental areas after each date of application. Sodium chlorate, sodium tetraborate (Concentrated Borascu), 7.5% 2,4-D plus sodium borate (DB Granular), and (ethanol and isopropyl) amine of 2,4-D were applied at 5, 16, 4, and 1/2 pounds per square rod, respectively. The experimental design was a split plot with two replications. Results obtained one year after sterilant application indicate that the season of the year or the number of irrigations did not appreciably affect the bindweed control obtained. The average number of bindweed plants per square meter in the sorghum for the check, sodium chlorate, Concentrated Borascu, DB Granular, and 2,4-D were 32, 6, 3, 11, and 21, respectively. The number of plants per square meter for the same treatments in the wheat were 32, 1, 11, 24, and 25, respectively. The least significant difference for each study at the 5 percent level was 10. Determinations of chemical residual in the soil 2 weeks after the final application of herbicides in the wheat indicate that the 2,4-D persisted in the soil for less than two weeks, the DB Granular remained for about one month, and the Concentrated Borascu and sodium chlorate were in the soil for the three month period. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.)

Hoary Cresses and Bur Ragweed

Paul F. Sand

Summary

A wide variety of chemicals were used on bur ragweed as soil treatments. Among those giving excellent control were concentrated "Borascu", "DB Granular", "Erbon", "Chlorea" and 2,3,6-TBA and polychlorobenzoic acid.

Three years of work on hoary cress with amino triazole show that treatment with 6 lb/A followed by two cultivations or one cultivation followed by retreatment of 3 lb/A and a late cultivation in the fall produced over 99 per cent kill. Where the treated land was properly cropped the next season no hoary cress plants were observed.

Abstracts

Soil applications of herbicides to control bur ragweed (Franseria tomentosa). Nash, Russel L. Square-rod plots were established and applied on October 27, 1956, at Wallace, Nebraska. Plots were located in a semi-wet lagoon of Keith very fine sandy loam. Moisture during the 1957 growing season totaled 18 inches. A number of chemicals were applied as a preliminary experiment. Listed are the chemicals, rate, and per cent reduction in stand of bur ragweed on September 20, 1957: Concentrated Borascu at 12 and 15 lb/sq rd gave 80 and 98% reduction; sodium chlorate at 5 and 7 lb/sq rd, 100 and 99%; DB Granular at 5 and 7 lb/sq rd, 99 and 99%; Erbon at 120 and 160 lb/A, 100 and 100%; Ammate at 4 and 5 lb/sq rd, 25 and 10%; Chlorea at 5 and 7 lb/sq rd, 98 and 100%; Ureabor at 5 and 7 lb, 20 and 80%; 2,4-D ethanol at 40 lb/A, 80%; 2,3,6-trichlorobenzoic acid at 40 and 60 lb/A gave 100 and 100% reduction; 2,4,5-T ester at 40 lb/A, 90%; diuron at 80 and 120 lb/A, 80 and 75%; 2,4-D isooctyl ester at 40 and 60 lb/A, 20 and 90%; 2,4-D amine at 40 and 60 lb/A, 90 and 98%; 2,4-D potassium salt at 40 lb/A, 90%; MCP potassium salt at 40 lb/A, 99%; 2,4-D lithium salt at 40 lb/A, 85%; MCP lithium salt at 40 lb/A, 100%; Polychlorobenzoic acid (ACP-M-177) at 20 and 40 lb/A, 100 and 100%; Polychlorobenzoic acid (ACP-M-103A) at 20 and 40 lb/A, 90 and 100%; 2,4-D amide at 40 lb/A, 80%; Amizol (powder) at 40 lb/A, 0%; Amizol (liquid) at 40 lb/A, 0%; and 2,4,5-T amide at 40 lb/A gave 90% reduction in stand. These results indicate many of these chemicals may be used to eliminate small areas of bur ragweed under similar conditions when used at these rates. (Contribution of the University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska)

Amino-triazole in eradication of Hoary Cress (Cardaria draba) 1954-56. Pavlychenko, Th. K. Solid infestations of Hoary Cress in Saskatchewan were selected for large size, 25 x 50 ft replicated plots to study the effectiveness of amino-triazole on this weed. In 1954 and 55 the chemical was used at 75 pct. active (Amizol) and in 1956 as 50 pct. active (Weedazol). Both chemicals were used at various rates up to 12 lb/A active. The results presented here are considered as final being 3, 2 or 1 year after the treatments were made.

Results: The entire work over a period of 3 years warrants the following deductions: (1) All single treatments at 3 lb/A rates were inadequate to give full eradication even where followed by one cultivation after the plants were discolored. (2) The same rates, followed by cultivation and retreated at 1/2 the original rate and followed by 2nd cultivation late in the fall, produced up to 90 pct. reduction in the original stand. The surviving plants, however, had a tendency to reinfest the area in subsequent years if left uncultivated and not cropped. (3) Single treatments

at 6 lb/A rate without cultivation also produced up to 10 pct. regrowth in terms of the original stand. The same rates followed by 2 cultivations or cultivation, retreatment at 1/2 the original rate and late cultivation in the fall produced over 99 pct. kill with only occasional escapes. Wherever the land was properly cropped the next season, no sprouts were observed in the growing crop. (Contribution of the Agricultural Division, American Chemical Paint Company, Saskatoon, Sask.)

Leafy Spurge and Russian Knapweed

Lyle A. Derscheid

Summary

Twelve abstracts reporting work done on leafy spurge and three abstracts reporting work done on Russian knapweed were submitted. Four of the leafy spurge abstracts are entered in the Research Report under the section on toadflax. For the most part these abstracts confirmed previous findings with soil sterilants, however, a few results with newer chemicals reported.

Concentrated Borascu has generally been effective on leafy spurge and Russian knapweed at rates of 10 and 15 lb./sq.rd. of product respectively. This year, 5.5 lb./sq.rd. gave 99-100% elimination of leafy spurge in two experiments in Saskatchewan, but 11 lb./sq.rd. was needed to give 97% in a third experiment and 16.5 was needed to give 100% kill in a fourth experiment in the same Province. A rate of 15 lb./sq.rd. gave 95% kill of Russian knapweed in one test in Saskatchewan.

Borate-chlorate mixtures have also generally been effective at the same rates as Concentrated Borascu. One report this year indicated that 2.75 lb./sq. rd. was sufficient for leafy spurge in Saskatchewan, and another report indicated that 8 1/3 lb./sq.rd. was not enough for Russian knapweed in the same Province.

A borate-2,4-D mixture has generally been effective on both weeds at a rate of 5 lb./sq.rd. of product. Three reports indicated that 2.75 lb./sq.rd. gave 90% kill of leafy spurge in Saskatchewan and that 5.5 lb./sq.rd. gave 99 to 100% kill. This higher rate gave 95% kill and a rate of 7.25 lb./sq.rd. gave 100% kill in two experiments in the same Province, but 6 lb./sq.rd. was not satisfactory in Nebraska.

A Borate-urea mixture has, in general, been ineffective on these two weeds, however, 5.5 lb./sq.rd. of product killed 85% of the spurge in one Saskatchewan test and rates of 5.5 and 7.25 lb./sq.rd. were quite satisfactory on Russian knapweed in another test.

A Chlorate-borate-urea mixture has generally been satisfactory on both species of weeds at a rate of 5 lb./sq.rd. of product. In one test this year 50 lb./A killed 50% of the leafy spurge and in another test 5.5 and 7.25 lb./sq. rd. eliminated almost 100% of the Russian knapweed. The lower rate allowed some regrowth the second year after treatment and the higher rate did not.

Erbon has been quite effective on both species of weeds at a rate of 1 lb./ sq.rd. of product. In a Saskatchewan test 150 lb./A killed 95-99% of leafy spurge, while rates of 1 1/2, 3 and 4 lb./sq.rd. eliminated 100% of this weed in Manitoba. One application of 1/2 lb./sq.rd. was no good on Russian knapweed in Nebraska.

Ammonium sulfamate at a rate of 4 lb./sq.rd. of product has generally been effective for eliminating both leafy spurge and Russian knapweed. Results this year show that 870 lb./A were sufficient for leafy spurge in Saskatchewan and 4 and 6 lb./sq.rd. rates gave 100% kill in Manitoba.

The Urea compounds have, in general, been ineffective on these deep rooted weeds. Reports this year showed that 50 lb./A of monuron, diuron and fenuron only killed 50% of the spurge and 4 lb./100 sq.ft. of neburon was ineffective on Russian knapweed.

Results to date with Amizol have been somewhat erratic on both species of weeds. In one experiment this year in Saskatchewan 5 lb./A followed by cultivation and 6/A without cultivation gave fair control, while 6 lb./A and higher rates followed with cultivation when the plants had pale yellow color resulted in 93% or better elimination. In a South Dakota experiment rates of 6, 8 or 10 lb./A of active ingredient applied in September followed 10 days with a plowing eliminated less than 50% of the spurge. In another experiment in Saskatchewan several combinations of 2,4-D, ATA and cultivation were very effective. Also in Saskatchewan 10 lb./A was not effective on Russian knapweed and 20 lb./A stunted the growth.

Heavy rates of 2,4-D have also given sporadic results in the past. Generally late fall applications have been most effective. This year results from Saskatchewan indicated that May applications of, as much as 105 lb./A, only killed 30% and that September applications of 170 lb./A only eliminated 70% of the leafy spurge. Likewise a 32 lb./A application did not give complete kill of Russian knapweed.

The polychlorobenzoic acid derivatives have been tested on leafy spurge and Russian knapweed for 2 or 3 years. In one Nebraska test 20, 40 and 60 lb./A of 2,3,6-TBA applied in October gave 76, 99 and 98% elimination of spurge, while a South Dakota test gave 50, 82 and 86% elimination with 2, 4 and 6 lb./A of active ingredient applied in early September and plowed 10 days later. The same chemical applied at 10 lb./A in Saskatchewan gave complete elimination of Russian knapweed, whereas, 40- and 60-lb./A rates killed 95-100% in Nebraska with 20 lb./A being less effective. Poly-TBA has been about equal to 2,3,6-TBA for both weeds in Nebraska.

Rates of 40, 60 and 80 lb./A of 2(2,4,5-TP) killed 95-100% of leafy spurge in Nebraska, while rates of 10, 15 and 20 lb./A active ingredient killed 0, 56 and 85% in South Dakota when the spurge was plowed 10 days after spraying.

Abstracts

Leafy Spurge

The effect of several herbicides on the control of leafy spurge, 1957. Coupland, R. T. and G. W. Selleck. Chlorea (sodium chlorate 40%, sodium metaborate 57%, monuron 1%) at 50, 100 and 200 lb./A total product, erbon (2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate) at 50, 100 and 150 lb./A active ingredient, ammate (ammonium sulphamate) at 435, 870 and 1305 lb./A, fenuron (3-(phenyl)-1, 1-dimethylurea) at 25, 50 and 100 lb./A, monuron (3-(p chlorophenyl)-1, 1-dimethylurea), and diuron (3-(3,4-dichlorophenyl)-1, 1-dimethylurea) at 50 lb./A active ingredient were applied to leafy spurge on 100 sq. ft. plots on sandy soil near Saskatoon in June, 1955. The effects in 1957 were quite similar to those reported in 1956. The heavy rate of erbon and the medium and heavy rates of ammate provided 95% to 99% control of leafy spurge accompanied by severe damage to grass. The light rate of erbon gave 90% control. The chlorea had little or no effect on the grass and provided less than 50% control of leafy spurge. All rates of the urea compounds provided 100% control of

the grass but only the heaviest rate maintained any measure of control (70%) of leafy spurge. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

Effect of Baron and Ammate on the control of leafy spurge (Euphorbia esula). Craig, H. A., Brynt, A. Baron and Ammate X were applied to leafy spurge in native grass on light loam soil at Rossendale, Manitoba, on August 1, 1957. Baron was applied at 1 1/2, 3 and 4 1/2 lbs./sq.rd. and Ammate X at 4, 6 and 8 lbs./sq.rd. When plots were inspected during late September, leafy spurge top growth was found dead in all plots. Grass in the Baron treated plots also appeared dead, but the grass in the Ammate X treated plots was more lush and green than the check plots. Further inspection required in 1958 to determine degree of control of the spurge. (Contributed by Weeds Commission, Manitoba Department of Agriculture and Immigration.)

Further observations of various chemicals on the control of leafy spurge (Euphorbia esula). Craig, H. A., Watson, D. W., Fraser, D. D., and Fox, W. D. Further inspection was made during early October 1957 of trials with soil sterilant chemicals conducted during the fall of 1955 and the summer of 1956, on a moderately heavy infestation of leafy spurge in native grass on light loam soil at Rossendale, Manitoba. Plots treated in September 1956, with D.B. granular at 6 and 8 lbs./sq.rd. remained free of leafy spurge and plots treated with D.B. powder at 6 and 8 lbs./sq.rd. still showed only a trace of leafy spurge. Some increase in leafy spurge was noted in plots treated with ammate at 4 lbs./sq.rd.

Plots treated in July 1956 with ammate, D.B. granular and D.B. powder at rates of 6 and 8 lbs./sq.rd. inspected in September 1957 were still free of leafy spurge but the 4 lbs. rate showed traces of reinfestation. (Contributed by Weeds Commission, Manitoba Department of Agriculture and Immigration.)

The effectiveness of fall applications of ATA; 2,3,6-TBA 2(2,4,5-T and 2(2,4-DB) for killing leafy spurge. Derscheid, Lyle A. Duplicate 2-rd. x 4-rd. plots of small grain stubble were sprayed September 4, 1956 with ATA at 6, 8 and 10 lbs./A, with 2,3,6-TBA at 2, 4 and 6 lbs./A, with 2,(2,4,5-TP) at 10, 15 and 20 lbs./A and 2(2,4-DB) ester at 10 lbs./A using 40 gal./A of spray solution. All plots were plowed September 14 (10 days after spraying) and seeded to oats in April 1957. Percentage of kill was determined by comparing weed counts made on 4-sq.yd. areas on May 30, 1957 with counts on the same areas on May 12, 1956. The highest rate of ATA killed 49% of the spurge, lower rates were less effective. The 3 rates of TBA killed 50, 82 and 86 per cent of the leafy spurge respectively. The 3 rates of 2(2,4,5-TP) killed 0, 56 and 85 per cent respectively and the 2(2,4-DB) allowed the stand to become more dense. The residual effect of the 6-lb./A and 20 lb./A of 2(2,4,5-TP) resulted in a shorter thinner stand of oats in 1957. Also the residual effect of 15 lbs./A of 2(2,4,5-TP) and the lb./A rate of TBA reduced oat yields about 12% below average of other plots and the 20 lbs./A rate of 2(2,4,5-TP) reduced the yield about 20%. These data indicate that these non-selective chemicals may be useful in eliminating leafy spurge if applied in the small grain stubble, but that there is some danger of reducing crop yields the following year from the residual chemical. (Contribution of the Agronomy Department, South Dakota State College, Brookings, South Dakota.)

Responses of Leafy spurge (Euphorbia esula) to Amino-triazole treatments 1954-56. Pavlychenko, T. K. In view of the known resistance of leafy spurge

to rest of the standard contact and systemic herbides, special emphasis was placed on the experimental tests with amino-triazole, a new rapidly translocating material on this weed. Large infestations were used at various points in Saskatchewan for treatments ranging from 1 1/2 to 16 lbs./A of active amino-triazole. One series of replicated plots at all rates was left undisturbed after single treatments. Another similar series was treated and cultivated once after the plants turned pale. The third series was treated, cultivated and re-treated. The 4th treated, cultivated, retreated at 1/2 the original rate and cultivated late in the fall. In 1957 the final readings were taken from all these treatments.

Results: All rates up to 5 lbs./A single or followed by one cultivation as well as those further followed by retreatments at 1/2 the original rate and then by fall cultivation - produced enough regrowth the following season to render them only fair to unsatisfactory. The same is true of the 6 lbs./A rates with no cultivation or retreatment. The 6 lbs./A rates followed by cultivation produced up to 93 per cent reduction of the original stand the next season. When the original treatment was followed by cultivation, retreatment at 1/2 the original rate and second cultivation in the late fall, a normal crop of spring rye was grown with only occasional sprouts being found in the crop. The same applies to all the rates above 6 lbs./A. In the plots treated once and left undisturbed for the rest of the season it was consistantly observed that the amount of regrowth was conspicuously decreasing in all late treatments as compared to the applications made at the early "rozette" to "bud" stages. Unfortunately our latest treatments were only at the "full bloom" stage. (Contributed by Agricultural Division, American Chemical Paint Company, Saskatoon, Sask.)

Control of leafy spurge with fall treatments of several chemicals. Sand, P. F. Triplicate square rod plots were treated October 31, 1956. Stand counts were made (9-21-56) before treatment from three square yards in each plot and again the following year on 9-30-57. Treatments and percent kill are as follows: sodium salt of 2,3,6-TBA at 20, 40, and 60 lb./A gave 76, 99, and 98 percent kill; Polychloro benzoic acid (ACP 177) at 20, 40, and 60 lb./A gave 65, 90, and 99% control; Polychloro benzoic and (Benzoic 103) at 20, 40, and 60 lb./A gave 82, 88, and 93 percent kill; 2-(2,4,5-TP) amine salt at 40, 60, and 80 lb./A gave 99, 99, and 94 percent kill of leafy spurge. The stands in the check plots were down 31 percent from the 1956 counts. (Contribution of the Department of Agronomy, College of Agriculture, Lincoln, Nebraska.)

The effect of various treatments on regrowth of leafy spurge, 1957. Selleck, G. W. Regrowth of leafy spurge was counted in five, 0.5 meter quadrats after the weed had been mowed, rototilled and sprayed with ATA and the butyl ester of 2,4-D on 15 x 136 ft. plots, on May 16, 1957. Leafy spurge was in the late budding to early blossom stage. The herbicides were applied with a logarithmic sprayer at initial rates of 8 lb./A of 2,4-D and 20 lb./A of ATA. The sprayer delivered 34 gal./A and the concentration of the herbicide decreased continuously along the length of the plot so that the rate was halved every 21 ft. The following table indicates the mean density of regrowth of leafy spurge per 0.5 sq.m. one month after treatment. A total of six treatments were required to control the regrowth of leafy spurge from May 16 until freeze-up. These consisted of six applications of 2,4-D, or six treatments of a combination of ATA and tillage (alternate spraying and tillage at approximately three-week intervals). Where mowing was substituted for the first application of ATA, the last cultivation was not necessary. When ATA was applied to leafy spurge in the late-flowering stage (July 9) or when the late-flowering stage was reached after

Treatment	No. of shoots
Untreated check	67
Mowing	51
Rototilling	158
2,4-D	3
ATA	9
ATA, followed by discing after 3 weeks	44

an initial mowing (July 29), further treatments were not necessary. Top growth of leafy spurge was killed 100% at rates between 20 lbs./A and 3.2 lb./A of ATA and between 8 lb./A and 6 oz./A of 2,4-D. (Contribution from the Department of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of 2,4-D and borate compounds in combating re-invasion of toadflax and leafy spurge, 1957. Selleck, G. W. Regrowth of toadflax and leafy spurge on sandy-loam soil was treated in June, 1956, with a complex of borate and 2,4-D (43.2% B_2O_3, 7% 2,4-D) at 0.5 lbs./100 sq. ft., Concentrated Borascu (61.5% B_2O_3) at 1 lb./100 sq. ft. total product and dimethyl amine of 2,4-D at 10 lbs./A active ingredient. The herbicides were applied in 4 ft. strips across 16 x 100 ft. plots which had been treated in May, 1955 with Borascu at 1, 2 and 4 lb. and borate-2,4-D at 1/2, 1 and 2 lb. of total product/ 100 sq. ft. 2,4-D amine at 35, 70 and 105 lbs./A had been applied to leafy spurge. In 1956 and 1957, borate-2,4-D and Borascu maintained 100% control of toadflax in re-treated portions compared with 50% to 85% control in the remainder of the plots. 2,4-D maintained 90% control during both years. Leafy spurge, which was controlled 75% one year after the initial treatment improved to 100% control in 1956 after re-treatment and was maintained at 95% to 99% in 1957. Where the initial treatment controlled leafy spurge 70% or less, re-treatment with 2,4-D provided 95% control in 1956 and 85% in 1957. In plots which were treated initially with 2,4-D, the second application increased percentage control from 45% to 85% in 1956, but the effect had worn off by 1957. Borascu was the most effective in re-treating plots of leafy spurge, followed by the borate-2,4-D mixture and 2,4-D. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

Russian Knapweed

The effect of herbicides on Russian knapweed (Centaurea repens). McCurdy, E. V. An area of Russian knapweed growing in competition with brome grass was divided into plots 10 feet square. During the past 6 years the stand has been thinned by repeated applications of 2,4-D at 2 lb./A but eradication has not been complete. In 1956, 2,4-D was applied at 32 lb./A, and although the weed was severely setback, regrowth was quite strong in 1957. DB spray powder at 2 and 3 lb./plot resulted in partial control. DB Granular at 2 lb./plot was not heavy enough but at 3 lb./plot gave excellent control. Polybor chlorate at 2 lb./plot killed many plants and where applied at 3 lb./plot little regrowth occurred in 1957. Ureabor at 2 and 3 lb./plot removed all brome but a few Russian knapweed plants remained. Chlorea at similar rates applied in 1955 resulted in the same degree of control but some regrowth was noted in 1957 in the plots treated at 2 lb./plot. The latter chemical was applied at 1/2 lb./plot

in 1956. This rate was not heavy enough but control was satisfactory with the 1 lb./plot rate. Neburon at 4 lb./A was not satisfactory. Nothing was accomplished with Weedazol (amino-triazole) at 10 lb./A but in the plots where the rate was increased to 20 lb./A the weeds were shrivelled and light yellow in color this fall. Heyden 1281 (trichlorobenzoic acid) was applied at 10 lb./A in 1955 and the plots were still completely free of any Russian knapweed in 1957. When this same chemical was applied at 4 lb./A in 1956 control was satisfactory, but at 2 lb./A the results were erratic. (Contributed by the Experimental Farm, Indian Head, Sask., Canada.)

Control of Russian knapweed. Krejci, Allan E. and Bush, Dale A. Triplicate square rod plots on Russian knapweed were treated on 23 October 1956. During the spring of 1957 the ground was accidentally double disked and seeded to sorghum. The chemicals and rates used were: 2,3,6 trichlorobenzoic acid and polychlorobenzoic acid at 20, 40, and 60 lbs./A; Sodium chlorate at 6 lbs./sq. rd.; DB Granular at 6 lbs./sq. rd. and Erbon at 2 pts./sq. rd. Estimate of stand reduction was made on 2 October 1957. The 40 and 60 lbs./A rate of both the trichlorobenzoic acid and the polychlorobenzoic acid were giving a 95 to 100 percent control. Sodium chlorate at 6 lbs./sq. rd. was giving a 90 to 95 percent control. The Erbon and DB Granular plots were showing little control. (Contribution of the Weed Division, Department of Agriculture and Inspection, Lincoln, Nebraska.)

The effect of borate compounds on Russian knapweed and hoary cress, 1957. Selleck, G. W. Concentrated Borascu (61.5% B_2O_3) at rates of 1, 2, and 4 lb. and a complex of Borate-2,4-D (43.2% B_2O_3, 7% 2,4-D) at 0.5, 1 and 2 lb. of total product per 100 sq. ft. were applied to globe-podded hoary cress and Russian knapweed on aluvial clay soil at Log Valley and Leader, Sask. The herbicides were applied July, 1956 with a 4-ft. Gandy spreader to plots 16 x 100 ft. The average percentage control of weeds at Log Valley and percentage regrowth of grass at Log Valley and Leader in 1957 (based upon visual estimates taken in June, 1957) are presented below.

Herbicide	Rate of application, lb/100 sq. ft.	Percentage control		Percentage regrowth of grass	
		Hoary cress	Russian knapweed	brome-grass	western wheatgrass
Concentrated borascu	1	0	0	90	100
	2	0	10	25	90
"	4	0	95	5	30
D.B. granular	0.5	0	50	100	100
"	1	50	75	90	90
"	2	70	95	25	60

Very poor control was obtained at Leader. Top growth was dense when the herbicides were applied, possibly preventing good contact with the soil. The 4-lb. rate of Borascu controlled Russian knapweed by 75% in June, 1957. Hoary cress was not adversely affected by either herbicide. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

TOADFLAX AND OTHER PERENNIAL HERBACEOUS WEEDS

Summary

H. A. Friesen

Toadflax

Eleven abstracts were submitted from three institutions. The results from new as well as further observations from previous trials with compounds containing borate in various proportions; 2,4-D alone or in combinations with grass and tillage were reported in eight of the abstracts.

Borascu (61.5% B_2O_3) on the basis of the 1957 assessments again resulted in 95-100% kills of toadflax growing in sod when used at rates of 2 lb/A or higher. No viable roots to 3 foot depth. Thinning of the grass stand by 50% or higher was associated with these dosages. While one report indicated 100% kill with borascu at 1 lb/A it would appear that this dosage applied in two successive seasons would result in a more lasting control, and less injury to the grass. Toadflax seedlings and annual weeds tended to grow more readily on plots treated at the 1 lb/A rate. One report indicated promise from the use of borascu at ½ lb/A as a substitute for tillage on fallow.

Borate-2,4-D complex (DB) tended to result in control of toadflax essentially equal to that obtained with comparable rates of borascu. However, this complex tended to be less harsh on the competing grass. The granular form appeared somewhat superior to the spray. One report indicated 100% toadflax control with two dosages at ½ lb/A spaced 2 years apart.

Polybor chlorate while producing a similar trend of results was generally less effective than either borascu or DB on toadflax and was more injurious to grass.

Ureabor (B_2O_3+ Monuron) at 1 and 2 lb/A gave 90 and 100% kills of both toadflax and grass with no viable roots to 3 foot depth. Persistence in the soil not yet fully established.

Gerstley borate (33% B_2O_3) one report 4 lb/A rate gave 90% kill of toadflax with no injury to grass.

2,4-D dimethyl amine at rates 35 to 170 lb/A was much less effective when applied in May or July as compared with September. Retreatment at 10 lb/A in following year improved control. However, regrowth was equal to original stand within one year of retreatment. Infested land part fallowed and seeded to fescue or brome and sprayed at 1 to 2 lb/A over 3 successive years has resulted in nearly 100% elimination of the weed. Brome noted to be a stronger competitor than the creeping red fescue.

ATA one report showed 96% elimination from two 16 lb/A applications. Tillage one day after the second treatment largely nullified the control.

Monuron at 80 lb/A has prevented regrowth for the past 6 seasons. Keys has found little difference between continuously black fallow and fallow where regrowth was permitted for 1 week before further tillage. Fall tillage and the use of the plough for the initial fallow operation showed benefit. Two consecutive years in fallow held little advantage over a single year. Indications are that two crops after fallow rather than one may be taken without undue yield suppression due to toadflax, provided good fall tillage and early maturing coarse grain is used.

Field Horsetail

ATA at 5 lb/A applied in 1956 continued to give some 95% control in 1957. Under similar conditions formulations of MCPA at 4 oz/A resulted in 70% control while 2,4-D ester and 2,4-5T ester at the same rate resulted in 60% control. Dalapon and 2,3,6-TBA at 10 lb/A were unsatisfactory. MCPA ester and amine at 2 oz/A resulted in 88 and 100% control of horsetail in alfalfa and alsike clover; similar control was obtained with 4(MCPB) at 8 oz/A.

Absinthe

Borascu and borate-2,4-D complex at rates of 567 and 1069 lb/A respectively gave nearly 100% control over a two year period. In further report ammate, borascu chlorea and ureabor at rates of 80 lb/A did not give satisfactory control. 2,4-D ester, 2,4,5-T ester (alone or as mixtures) and MCP ester resulted in 90% kill of top growth at rates of 28 lb/A. 2,4-D amine was much less effective. June applications of phenoxy-type herbicides were superior to August and September treatments. ATA and TBA at 13.6 and 15.5 lb/A respectively gave complete control throughout the 1957 season.

Blueweed

Sweep tillage, moldboard plowing, 2,4-D and combinations of sweep tillage and 2,4-D reduced the stand of blueweed 75, 56, 52 and 75% respectively.

Ethanol and isopropyl amine of 2,4-D at ½, DB (granular) at 4, sodium chlorate at 3, borascu at 16 and monuron at 3/8 lbs/sq. rod, respectively, resulted in 85% control.

Bladder Campion

DB granular and spray powder (borate-2,4-D complex) and polybor chlorate each at 2 lb/100 sq. ft. and monuron at 40 lb/A prevented regrowth from 1955 to 1957. TBA at 10 lb/A, ATA at 12 lb/A and 2,4-D at 12 lb/A were unsatisfactory.

Climbing milkweed

PCB, notably the lithium formulation resulted in 100% top growth control at rates of 8 lb/A and higher. Similar results were obtained with erbon at ½ lb/sq. rod. ATA 4(2,4-DB) and MCP potassium salt at rates of 8 lb/A also gave excellent control.

Abstracts of Results of Cooperators

Control of toadflax by 2,4-D in combination with a competitive grass. Carder, A.C. An area heavily infested with toadflax was partially fallowed in 1952, fitted for seeding in the spring of 1953 when half of the area was sown to creeping red fescue and the other half to brome. Good stands of grass were obtained along with a considerable growth of toadflax consisting mostly of resprouts from the roots of older plants. No nurse-crop was used with the grasses. In the summers of 1953 through to 1957 when the toadflax was in late bud the butyl ester of 2,4-D was applied by boomed plot sprayer at nil, 1, 2, 3 and 4 lb/A acid in aqueous solution at 10 gal/A.

Appraisal of toadflax suppression was made in the fall of each year treatment was carried out. The data in the table show that the grasses offered over the course of time heavy competition to toadflax even without the application of 2,4-D. Brome seemed particularly aggressive. The additional suppressive effect of the 2,4-D treatments on the toadflax was at first marked but decreased in subsequent years. There is no positive indication that any treatment in the course of the experiment eliminated toadflax although one treatment, bromegrass plus 3 lb/A of 2,4-D, did achieve this result. However, the 4-lb. rate of 2,4-D in this series did not ensure complete kill. Nevertheless, the data indicate that 2 lb/A and more of 2,4-D with fescue, and 1 lb/A and more of the chemical with bromegrass almost gave complete elimination. It was also noticed that wherever one or more pounds of 2,4-D had been applied no viable toadflax seed was produced in any year.

Grass inclusion	Lb/A active 2,4-D	Percentage survival* of toadflax				
		1953	1954	1955	1956	1957
Creeping red fescue	Nil	80.0#	50.0	22.0	13.8	13.2
	1	72.0	34.0	9.8	6.0	4.2
	2	64.0	25.5	9.2	3.8	2.2
	3	32.0	14.0	7.8	3.2	2.2
	4	24.0	10.0	7.0	2.8	1.5
Bromegrass	Nil	80.0	40.0	10.2	2.5	3.5
	1	48.0	29.6	5.8	2.5	1.5
	2	40.0	24.4	5.8	2.5	2.2
	3	24.0	12.8	2.8	1.0	0.0
	4	24.0	8.8	2.0	0.8	1.2

* Arbitrary units by same appraiser # Av. quadruplicate plots.
(Contribution of Experimental Farm, Beaverlodge, Alberta.)

The use of ATA alone and combined with tillage for the control of toadflax. Carder, A.C. On June 1, 1956, different rates of ATA were applied in 40 gal/A aqueous solution by boomed plot sprayer to a continuous infestation of toadflax when 3-4 in. high or at late rosette. On August 1 when about 2 in. of regrowth had occurred half of each plot was retreated with the same dosage as used at the initial application. One day later one series of plots was one-wayed 5 in. deep on the half-lap, while the remaining series was left undisturbed. The effectiveness of the various treatments was appraised in late July of the following year.

	Lb/A Active ATA	Percentage survival* one year after treatment	
		No retreatment	Retreatment
No tillage	8	82#	18
	12	68	12
	16	16	4
Tillage	8	98	72
	12	75	75
	16	68	70

* Arbitrary units. # Av. duplicate plots.

The data in the table show that tillage reduced the effect of ATA, particularly at the heavier rates and where retreatment of the chemical was made because the plants were turned under 24 hours after receiving the chemical. Where no tillage was given retreatment greatly increased the effectiveness of the chemical. Where two applications of ATA at the rate of 16 lb/A were applied 96% of the toadlfax was eliminated. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Effect of herbicides on control of toadflax (Linaria vulgaris). Keyes, C.H. C.M.U. applied to toadflax in 1951 at 80, 100 and a double application of 40 lbs/A has sterilized the soil for the past seven years with no indications of a breakdown. Plots treated with atlacide and polybor chlorate have produced normally for the past three years and toadflax has been working into these plots from the borders. 2,4-D ester at 20, 25 and 40 pounds per acre, applied in 1954, is still showing a pronounced depressional effect and crested wheat grass is gradually seeding itself into this area. Rates of ½, 1, 2, 3, 4 and 6 lb/100 sq. ft. of concentrated borascu, D.B. granular and ureabor were applied to replicated, randomized plots, of crested wheat grass containing toadflax, in May 1956. Ureabor at 3 lbs. and up has sterilized the soil. The ½ and 1 lb. rates provided rather spotty control while the 2 lb. rate resulted in good weed control but damaged the grass severely. D.B. Granular was less toxic than ureabor. Although the grass was completely killed out at the 4 and 6 lb. rates it was noted that Russian thistle grew rather well with no evidence of toadflax. Concentrated borascu provided excellent weed control at rates of 2 lb. or more. There was some evidence of grass damage at the 4 and 6 lb. rates. The ½ and 1 lb. rates have not provided complete toadflax control. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Combination of chemical and cultural treatments of fallow for toadflax (Linaria vulgaris) control. Keyes, C.H. Various chemicals have been tried as a substitute for tillage during the fallow year. In 1954, light rates of soil sterilants were applied as a tillage substitute. These included atlacide and polybor chlorate at 80 lb/A and Monuron at 10 lb/A. The effects of these treatments were still noticable in the wheat crop, particularly monuron, by reduced stands and an occasional bare spot. A.T.A. at 2, 4, 6 and 8 lb/A applied as a tillage substitute on fallow in 1956 appears to have some effect on weed growth in the subsequent crop. Post-harvest weed scores would indicate that ATA at the 6 and 8 lb/A rates reduced the toadflax by some 75%. Several rates of concentrated borascu, D.B. Granular, and ureabor were applied, on land to be fallowed, early in May, 1957. The rates were ½, 1 and 2 lb/100 square ft. of each chemical. One subsquent tillage operation was performed to cut off growth that had begun prior to chemical treatment and a second operation was done in mid August to check water erosion. At the end of September there was no evidence of any regrowth of toadflax on any of these plots. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada).

Cultural treatments of fallow and stubble for toadflax (Linaria vulgaris) control. Keyes, C.H. Fallow treatments for the control of toadflax have included (1) black or intensively tilled fallow; (2) fallow tilled at intervals that allowed top growth to appear for about one week; (3) intensive fallow using a oneway for the initial spring tillage; and (4) intensive fallow using a plough for initial spring tillage. There was practically no toadflax to be found at the conclusion of the fallow, wheat rotation cycle in treatments 1 and 2 mentioned above. In treatment 4,

regrowth of toadflax was considerably delayed subsequent to the initial spring treatment when compared to treatment number 3. Post-harvest tillage treatments of stubble have included; (1) ploughing; (2) blade weeding; (3) onewaying and; (4) no cultivation or check. These treatments have resulted in reduced cultivation or check. These treatments have resulted in reduced infestations of toadflax, compared to the check plot, when they precede a second grain crop. Differences between treatments have been small with the plough providing the best control measure. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada).

Rotational practices for toadflax (Linaria vulgaris) control. Keyes, C.H. An alternate fallow and grain (wheat) rotation has been compared with two years of fallow and grain, four years of fallow and grain and fallow, grain, grain rotations. The difference in weed control between one year of fallow and two years of fallow have been of little consequence. As far as can be determined at this time, toadflax has been eradicated after four years of black fallowing. Growing a second crop after fallowing has resulted in an increase in the weed infestation as compared to the alternate crop and fallow system, but this increase has not been of sufficient magnitude to effect the crop yield adversely. Thorough post-harvest and pre-planting tillage operations coupled with an early maturing crop such as barley plus fertilizer has controlled the weed increase to within 5-10% of the population after the first crop. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada).

The effect of various herbicides on leafy spurge and toadflax, 1957. Selleck, G.W. Concentrated Borascu (61.5% B_2O_3) at rates of 1, 2 and 4 lb., a complex of borate and 2,4-D (43.2% B_2O_3, 7% 2,4-D) at 0.5, 1 and 2 lb., Ureabor (45.4% B_2O_3, 4% monuron) at 0.25, 0.5, 1 and 2 lb., Gerstley Borate (33% B_2O_3) at 2, 4 and 8 lb/100 sq. ft. total product were applied to toadflax near Hague, Sask. and to leafy spurge near Saskatoon, Sask. on sandy-loam soil. The herbicides were applied to 16 x 100 ft. plots with a Gandy spreader on June 11, 1956. The average percentage control of weeds and regrowth of grass in 1956 and 1957 (based on visual estimates) are presented below.

Herbicide	Rate of application, lb/100 sq. ft.	Percentage control				Percentage regrowth of grass	
		Toadflax		Leafy spurge			
		1956	1957	1956	1957	1956	1957
Ureabor	0.25	5	10	10	0	7	10
"	0.5	45	65	10	15	5	15
"	1	80	97	35	50	0	0
"	2	98	100	80	85	0	0
Gerstley borate	2	10	99	10	60	100	100
"	4	60	90	70	70	100	100
"	8	80	100	95	99	77	57
Borate-2,4-D	0.5	65	80	80	75	90	100
"	1	75	99	85	90	95	100
"	2	99	100	100	95	55	92
Concentrated borascu	1	60	100	85	85	92	77
"	2	95	100	90	99	52	60
"	4	100	100	99	100	40	20

Live toadflax roots were absent to depths of 3 ft. where 100% control of toadflax was obtained on plots treated with Ureabor at 2 lb., and Borascu at 2 and 4 lb/100 sq. ft. Live roots were found at depths of 25 in. on plots treated with Borate-2,4-D at 2 lb. and Gerstley Borate at 8 lb/100 sq. ft. Gerstley Borate at 8 lb. had little effect on western snowberry, bull thistle, lamb's quarters or Russian pigweed. Borate-2,4-D at 2 lb. had little effect on wild buckwheat, lamb's quarters, wild rose, Russian pigweed, sheep serrel or western snowberry. The same species were present at the 1-lb. rate of Borascu and wild buckwheat, wild rose and sheep sorrel were present at the 4-lb. rate. Wild rose was not killed out by the 2-lb. rate of Ureabor. The grasses Agropyron dasystachyum, A. smithii, Agrostis scabra and Poa pratensis survived the 4-lb. rate of Gerstley Borate while the above species with the exception of Agrostis survived the 8-lb. rate. The same species were present where Borate-2,4-D at 2 lb. was applied, but Poa pratensis was absent at the 4-lb. rate. Only the Agropyrons were present where Borascu was applied. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation).

The effect of 2,4-D and borate compounds in combating re-invasion of toadflax and leafy spurge, 1957. Selleck, G.W. Regrowth of toadflax and leafy spurge on sandy-loam soil was treated in June, 1956, with a complex of borate and 2,4-D (43.2% B_2O_3, 7% 2,4-D) at 0.5 lb/100 sq. ft., concentrated Borascu (61.5% B_2O_3) at 1 lb/100 sq. ft. total product and dimethyl amine of 2,4-D at 10 lb/A active ingredient. The herbicides were applied in 4 ft. strips across 16 x 100 ft. plots which had been treated in May, 1955 with Borascu at 1, 2 and 4 lb. and borate-2,4-D at $\frac{1}{2}$, 1 and 2 lb. of total product/100 sq. ft. 2,4-D amine at 35, 70 and 105 lb/A had been applied to leafy spurge. In 1956 and 1957, borate-2,4-D and Borascu maintained 100% control of toadflax in re-treated portions compared with 50% to 85% control in the remainder of the plots. 2,4-D maintained 90% control during both years. Leafy spurge, which was controlled 75% one year after the initial treatment improved to 100% control in 1956 after re-treatment and was maintained at 95% to 99% in 1957. Where the initial treatment controlled leafy spurge 70% or less, re-treatment with 2,4-D provided 95% control in 1956 and 85% in 1957. In plots which were treated initially with 2,4-D, the second application increased percentage control from 45% to 85% in 1956, but the effect had worn off by 1957. Borascu was the most effective in re-treating plots of leafy spurge, followed by the borate-2,4-D mixture and 2,4-D. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

Further observations of the effect of borate compounds on toadflax and leafy spurge, 1957. Coupland, R.T. and G.W. Selleck. Numerous 100 sq. ft. plots of toadflax near Hague, Sask. and leafy spurge near Saskatoon, Sask. were treated in 1953 and 1954 with borate compounds on sandy-loam soil. Polybor-chlorate (73% borates, 25% chlorate) were applied to toadflax at rates from $\frac{1}{2}$ to 3 lb. and to leafy spurge at rates from 3 to 6 lb/100 sq. ft. Concentrated Borascu (61.5% B_2O_3) was applied to toadflax at rates from 1 to 7 lb. and to leafy spurge from 3 to 6 lb/100 sq. ft. Complexes of sodium borate (41% and 60%) and 2,4-D (7%) were applied to both weeds at rates of 1, 2 and 3 lb/100 sq. ft. The percentage control deteriorated by a mean of 10% on leafy spurge and 5% on toadflax since 1956. Reinfestation occurred from both roots and seed and considerable invasion occurred from the perimeters of the plots. Borascu at rates of 3, 4, 5,

6, 7 lb/A and the borate-2,4-D mixture in granular form at 1, 2, 3 lb/A mainta ined 90% to 95% control of leafy spurge. Less effective control was obtained with this herbicide in spray form and polybor-chlorate. Certain toadflax plots treated in 1953 were controlled 100% by polybor-chlorate at 1 lb/A and Borascu at 3 and 4 lb/A. Borascu maintained 90% to 95% control at 1 and 5 lb/A and polybor-chlorate at 1, 1.5, 2, 2.5 lb/A. Certain plots treated with Borascu at 4 lb., the borate-2,4-D mix at 1 lb., in a granular form and as a spray at 1 and 3 lb/A maintained 90% to 95% control. The stand of grass recovered completely in treated plots in competition with leafy spurge after 1956. The stand of grass was still reduced in 1957 in many of the toadflax plots where rates of Borascu exceeded 4 lb/A and polybor-chlorate exceeded 2 lb/A. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

The effect of 2,4-D and borate compounds on leafy spurge and toadflax, 1957. Selleck, G.W. and R.T. Coupland. The dimethyl amine salt of 2,4-D was applied to toadflax (near Hague) and to leafy spurge (near Saskatoon) at rates of 35, 70 and 105 lb/A active ingredient on plots 16 x 100 ft. in May, 1955. The intermediate rate was applied to leafy spurge in July. The herbicide was applied to both species in September, at rates of 57, 113 and 170 lb/A. The medium and heavy rates applied in the fall controlled leafy spurge 65% to 70% in 1957. 2,4-D which was applied in May and July controlled leafy spurge 30%, which was comparable to the control obtained by heavy applications of 2,4-D to toadflax. However, where couch grass was present, toadflax was controlled 70% to 95% compared with toadflax in couch grass infested check plots. These results were obtained only in plots where the herbicide was applied in the fall. In June, 1956 retreatment with 2,4-D amine at 10 lb/A was applied to both weed species across these plots. Retreatments of Concentrated Borascu (61.5% B_2O_3) at 535 lb/A and D.B. Granular (43.2% B_2O_3, 7% 2,4-D) at 259 lb/A were also applied to plots established in leafy spurge. Percentage control of leafy spurge varied between 75% and 95% in 1956 for all three herbicides. This control deteriorated to between 20% and 60% in 1957. The 10 lb/A rate of 2,4-D provided 95% control of the toadflax in 1956 where the 170 lb/A rate had been applied in the fall of 1955. Between 50% and 75% control was obtained on the remainder of the plots. Little effect was visible in 1957. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

The effect of borate compounds on leafy spurge and toadflax, 1957. Selleck, G.W. and R.T. Coupland. Concentrated Borascu (61.5% B_2O_3) at rates of 1, 2 and 4 lb. and a complex of borate and 2,4-D (43.2% B_2O_3, 7% 2,4-D) at 0.5, 1 and 2 lb. of total product per 100 sq. ft. were applied on 16 x 100 ft. plots in May and Sept., 1955, to toadflax on sandy-loam soil (Black Soil Zone) near Hague, Sask., and to leafy spurge on sandy soil near Saskatoon (Dark Brown Soil Zone). Similar treatments were made to toadflax and leafy spurge on sandy-loam soil (Brown Soil Zone) at Parkbeg, Sask. Reinfestation which occurred since 1956 was limited to less than 10% and originated from both roots and seed. The lower standard of control of toadflax which occurred in the 1-lb. rate of Borascu may be attributed entirely to the germination and establishment of seelings. Re-infestation

of both species from root and seed was more prevalent in portions of Borascu plots where the grass was killed. Regrowth from roots of both species which occurred in plots treated with heavy and medium rates of both herbicides initiated growth from live roots at depths between 24 and 34 in. Crested wheat grass was further advanced and more vigorous on plots treated with the borate-2,4-D mixture than on the checks. The grass was also further advanced on the Borascu plots, but the stands were thinner and less vigorous than the checks. The average percentage control of weeds and regrowth of grass in 1957 (based upon visual estimates) are presented below.

Herbicide	Rate of application lb/100 sq.ft.	Percentage control		Percentage regrowth of grass
		Toadflax	Leafy spurge	
Concentrated Borascu	1	91	48	100
" "	2	98	88	87
" "	4	98	97	66
Borate-2,4-D mixture	0.5	45	50	100
" "	1	88	91	100
" "	2	98	99	100

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon with financial assistance from the Sask. Agric. Research Foundation.)

Effect of different herbicides on field horsetail. Hoyt, P.B. In 1956 a number of herbicides were applied to field horsetail, Equisetum arvense. The results from these treatments are presented in the 1956 Research Report. In the autumn of that year the test area was plowed, then in the spring of 1957 disced and harrowed. On july 11, 1957, the area was platted identically to the platting arrangement of the previous year. Plant counts of horsetail were then made.

Herbicide	Rate/A active ingredient	Horsetail plants per sq. yd.
Dalapon	5 lb.	88*
	10	58
ATA	5 lb.	4
	10	5
2,3,6-TBA	5 lb.	122
	10	77
2,4,5-T (ester)	4 oz.	60
	8	42
2,4-D (butyl ester)	4 oz.	52
	8	45
2,4-D (amine)	4 oz.	60
	8	73
MCPA (butyl ester)	4 oz.	40
	8	41
MCPA (amine)	4 oz.	41
	8	41
MCPA (sodium salt)	4 oz.	39
	8	40
No chemical		110#

* Av. duplicate plots.
\# Count obtained from marginal areas.

The data in the table show that 1) ATA application gave marked reduction of horsetail stand; increasing the rate from 5 to 10 lb/A did not increase the effect of this chemical. 2) dalapon gave only moderate reduction; 10 lb/A produced about a 50% decrease in plant numbers, 3) 2,3,6-TBA had only a slight effect, even at 10 lb/A. 4) 2,4,5-T ester and the butyl ester of 2,4-D were about equally effective, giving decreases of approximately 60% at the 8 oz/A rate, 5) the butyl ester of 2,4-D was more effective than the amine of this chemical, and 6) the MCPA formulations were all equally effective and gave slightly greater reductions of horsetail stand than the butyl ester of 2,4-D applied at the same rates. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Control of field horsetail in new seedings of legumes by MCP formulations. Hoyt, P.B., Dobb, J.L. and Carder, A.C. On July 25,1957, three formulations of MCP were knapsack sprayed in aqueous solution at the rate of 40 gal/A to fully emerged field horsetail, Equisetum arvense, growing in newly seeded stands of alfalfa and alsike clover which were 3 in. high and in the true two-leaf stage. The experiment was appraised 2 weeks after the chemicals were applied. Procedure and results are shown in the table.

Treatment	Oz/A active ingredient	Percentage top growth kill* of horsetail	
		In alfalfa	In alsike
MCPA, butyl ester	1	48#	80
	2	88	100
	4	100	100
MCPA, sodium salt	1	10	48
	2	45	62
	4	90	100
MCPB, butyl ester	8	98	97
	12	100	100
	16	100	100

* Arbitrary estimate.
\# Av. triplicate plots.

Two oz/A of the butyl ester of MCPA gave essentially the same degree of top growth kill of horsetail as 4 oz/A of the sodium salt of this chemical. The above-ground parts of horsetail were completely killed in either legume by 4 oz/A of the butyl MCPA. MCPB, on the other hand, did not give this degree of kill until 12 oz/A were applied, although 8 oz/A resulted in almost complete killing. No numerical appraisal was made of the effect of the chemicals on the legumes, but the growth of the young alfalfa plants was noticeably retarded by all treatments, in some instances very severely. The degree of effect was in direct proportion to rate of chemical used. There was no necrosis of tissue. The alsike plants were only slightly affected by the chemicals applied at any rate. Alfalfa and alsike plants on a series of check plots which received no chemical were largely smothered by the growth of horsetail. Final results will not be known until 1958. (Contribution of Experimental Farm, Beaverlodge, Alberta).

Effect of herbicides on Absinthe. Molberg, E.S. A number of herbicides were applied at fairly heavy rates to Absinthe (Artemesia absinthium L. on non-cultivated land in order to determine which chemicals might be used for controlling this weed. The chemicals used and the rates of application of active ingredient per acre were 20 lb polychlorobenzoic acid (ACP103), 20 lb 2,3,6-TBA, 20# ATA, 2# 2,4-D butyl ester, 80 lb ammonium sulphamate (ammate), 80 lb anhydrous borax (concentrated borascue), 80 lb chlorate borate, monuron mixture (chlorea) and 80 lb borate, monuron mixture (ureabor). Applications were made July 8, 1957 and a month later, on August 9, the plots were observed and compared. The first four chemicals listed were all quite effective, though none gave 100% control. Small plants 2-3 inches high were easier to kill than the larger plants, which were 15-16 inches high. The ammate, borascu, chlorea

and ureabor did not appear very effective at the rates used. Further testing with the TBA, ATA, and 2,4-D should be done to determine the best rates of application. (Contributed by the Experimental Farm, Regina, Sask.)

The effect of various herbicides on Absinthe (Artemisia absinthium) and Dandelion, 1957. Selleck, G.W. Dimethyl amine of 2,4-D, MCPA butyl ester, low volatile esters of 2,4,5-T and 2,4-D-2,4,5-T each at rates of 1 and 10 lb/A active ingredient, a complex of borate and 2,4-D (43.2% B_2O_3, 7% 2,4-D) at 259 and 567 lb/A and Concentrated Borascu (615% B_2O_3) at 535 and 1069 lb/A total product were applied May 22, 1956 to Absinthe in plots 20 x 12 ft. The plots were assessed Sept. 3, 1956, June 13 and July 15, 1957, and a second treatment was applied June 13, 1957. None of the 1 lb/A rates of systemic herbicides or the granular materials appeared to affect the Absinthe in September, 1956. The 10 lb/A rates affected the leaves to some extent but little injury to inflorescences was noted. The old Absinthe stems were burned in April, 1957, providing 40% control of the new growth. The lb/A rates of 2,4-D amine, MCPA ester and 2,4,5-T ester controlled the Absinthe between 75% and 85% in May, 1957, which deteriorated to 50% in June and July. The 1 lb/A rate of 2,4-D-2,4,5-T esters maintained control between 75% and 80%. Both rates of the borate-2,4-D mixture controlled Absinthe 100% in May, but deteriorated to 70% control by July, 1957. All of the 10 lb/A rates and the 535 lb/A rate of Borascu maintained 90% to 95% control throughout the study period. The 1069 lb/A rate of Borascu provided 100% control of Absinthe. In May, 1957, dandelions lacked vigor in plots treated with the borate-2,4-D mixture at both rates and with Borascu at 1069 lb/A. The weed appeared vigorous in all plots treated with 1 lb/A and with MCP ester at 10 lb/A. Damage was visible to the dandelions in the remaining 10 lb/A rates. By July, 50% and 85% control was obtained in plots treated with the borate-2,4-D mixture at 259 lb/A and Borascu at 1069 lb/A respectively, but the survivors appeared vigorous. Satisfactory control of dandelion and western snowberry was obtained with the 10 lb/A rates of 2,4-D amine, 2,4,5-T ester, and 2,4-D-2,4,5-T esters. 2,4,5-T at 1 lb/A did not adequately control western snowberry. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effects of five herbicides on absinthe (Artemisia absinthium), 1957. Selleck, G.W. The dimethyl amine salt of 2,4-D low volatile esters of 2,4,5-T, mixed butyl esters of 2,4-D, the butyl ester of MCPA and low volatile esters of 2,4-D-2,4,5-T were applied with a logarithmic sprayer to duplicated plots 15 x 135 ft. at an initial rate of 17 lb/A to absinthe in a brome grass-crested wheat grass pasture on loam soil at Hepburn, Sask. The rate of application of herbicide decreased continuously along the length of the plot so that the rate was halved every 21 ft. The herbicides were applied June 21, 1957 when the absinthe was in the early budding stage. The plots were assessed Aug. 8 and Sept. 16, 1957. The percentage kill and degree of control tended to deteriorate throughout the season. The amounts of herbicides (lb/A) required to provide various percentages of kill and degrees of control are provided in Table 1. The data are based on visual estimates where 10 = complete kill and 6 = satisfactory control.

Table 1

	% kill				Degree of control		
	Aug.8		Sept.16		Aug.8		
Herbicide	90	80	100	90	7	6	5
2,4-D amine	8.8	7.4	-	11.0	11.4	7.0	5.6
2,4,5-T ester	2.8	1.8	-	-	3.2	1.2	-
2,4-D ester	2.2	0.5	13.4	7.8	1.8	-	-
MCPA ester	2.8	-	-	5.3	-	3.0	-
2,4-D-2,4,5-T ester	2.8	-	-	3.2	-	1.8	-

A second application of the same herbicides was applied to the same plots on Aug. 8, 1957. The amounts of herbicides (lb/A) required to provide various percentages of kill and degree of control are provided in Table 2.

Table 2

	% kill		Degree of control
Herbicide	100	90	5
2,4-D amine	11.4	3.2	3.2
2,4,5-T ester	3.6	2.2	2.2
2,4-D ester	13.4	7.8	7.8
MCPA ester	13.0	7.8	7.8
2,4-D-2,4,5-T ester	8.5	1.0	1.0

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of five herbicides on absinthe (Artemisia absinthium), 1957. Selleck, G.W. The dimethyl amine salt of 2,4-D, low volatile esters of 2,4,5-T, and TBA at initial rates of 25 lb/A, and ATA and Dalapon at initial rates of 40 lb/A active ingredients were applied with a logarithmic sprayer to duplicated plots 15 x 135 ft. on May 23, 1957, on loam soil at Hepburn, Sask. The herbicides were applied when the absinthe plants were 8 in. tall. The sprayer delivered 34 gal/A and the rate of application of herbicide decreased continuously along the length of the plot, so that the rate was halved every 21 ft. The plots were assessed June 19, Aug. 8 and Sept. 16, 1957. The percentage kill and degree of control tended to deteriorate throughout the season with 2,4,5-T and 2,4-D but tended to improve with TBA and ATA. The amounts of herbicides (lb/A) required to provide various percentages of kill at 3 dates are summarized in Table 1.

Table 1

	June 19	August 8			September 16		
Herbicide	100	100	90	80	100	90	60
2,4,5-T ester	3.7	-	5.1	3.0	-	-	5.2
2,4-D amine	3.0	-	9.2	-	-	-	-
TBA	13.7	15.5	-	-	-	13.0	-
ATA	27.0	13.6	-	11.5	14.0	6.0	-
Dalapon	32.0	-	20.0	17.6	-	-	21.0

The degree of control provided by various amounts of five herbicides (lb/A) at 3 dates are provided in Table 2. Control is based on visual estimates where 6 = satisfactory control and 10 = complete kill.

Table 2

	June 19		August 8			September 16		
Herbicide	8	5	7	6	5	7	6	5
2,4,5-T ester	1.8	1.0	2.0	-	1.0	-	-	-
2,4-D amine	2.3	1.5	2.0	-	1.7	-	-	-
TBA	9.7	5.0	-	3.6	-	-	5.3	-
ATA	19.0	11.0	-	2.8	-	6.8	-	6.5
Dalapon	-	29.0	-	10.5	-	-	-	21.0

A second application of these herbicides was applied to the same plots, August 8, 1957. The amounts of herbicides (lb/A) required to provide percentage kill and degree of control are summarized in Table 3.

Table 3

	% kill		Degree of control
Herbicide	99	90	6
2,4,5-T ester	5.0	-	-
2,4-D amine	6.2	-	3.5
TBA	10.5	2.3	4.0
ATA	4.0	2.5	2.7
Dalapon	18.4	14.0	18.4

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Chemical and cultural control of blueweed (Helianthus ciliaris) Wiese, A.F. and Rea, H.E. Blueweed control was attempted with sweep plowing 12 days after emergence, three moldboard plowings, two applications of propylene glycol butyl ether ester of 2,4-D at 2 pound per acre, and three sweep plowings and one spraying of 2,4-D during the 1955 growing season. The plot size was 1 by 2 rods and the experimental design was a randomized block with two replications. In the spring of 1956 the sweep tillage, moldboard plowing, 2,4-D, and combination of sweep tillage and 2,4-D reduced the stand of blueweed 75, 56, 52, and 75 percent respectively. The weeds emerged in approximately 14 days after plowing with a sweep implement giving a plowing interval of 26 days. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.)

Blueweed (Helianthus ciliaris) eradication with soil sterilants. Wiese, A.F. and Rea, H.E. In November, 1955, several herbicides were applied for eradication of blueweed to square rod plots in a duplicated randomized block design. Data taken two years later show that complete eradication of blueweed occurred from applications of 7.5% 2,4-D + sodium borates (DB Granular) at 6, sodium chlorate at 5 and 7, sodium tetraborate (Concentrated Borascu) at 12 and 20, 3-(p-chlorophenyl)-1, 1-dimethyl urea (monuron) at 1/2, and 3-(phenyl)-1, 1-dimethylurea (fenuron) at 1/4, 3/8 and 1/2 pounds per square rod, respectively.

Applications of (ethanol and isopropyl) amine of 2,4-D at 1/2, DB Granular at 4, sodium chlorate at 3, Concentrated Borascu at 16, and monuron at 3/8 pounds per square rod, respectively, did not eradicate blueweed but gave at least 85 percent control. Other chemicals in the test which gave less than 85% control were monuron at 1/4, 2,4-D at 1/4, and propylene glycol butyl ether ester of 2-(2,4,5-trichlorophenoxy) propionic acid at 1/4 and 1/2 pounds per square rod, respectively. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.)

The effect of herbicides on bladder campion (Silene vulgaris). McCurdy, E.V. DB Granular at both 2 and 3 lb/plot (all plots 10'x10') applied in 1955 and repeated in 1956 completely removed all bladder campion and no regrowth was apparent in 1957. DB Spray powder at similar rates was as effective but was more severe on the brome growing in competition with the weed. Polybor chlorate applied at 2 lb/plot in 1957 gave complete control. 103A (2,3,6-trichlorobenzoic) at 5 and 10 lb/A applied in July 1957 removed all bladder campion from the plots but this same chemical did not give complete control when applied at the same rates in 1956. A combination of 103A at 10 lb/A and 2,4-D at 2 lb/A gave very satisfactory results this year. An ester of 2,4-D at 2 lb/A burned all top growth but even with repeated applications during the past 3 years has not resulted in complete eradication. When 2,4-D was applied at 32 lb/A the control was not complete. Weedazol (Amino triazole) at 6 and 12 lb/A was of very little value. Plots treated with Karmex DW at 40 and 80 lb/A in 1955 are still free of all growth. (Contribution by the Experimental Farm, Indian Head, Sask., Canada.)

Chemical control of climbing milkweed (Gonolobus laevis). Anderson, L.E. Herbicides used in this study were applied as foliar sprays on July 8 and 9 to plants that were from 8 to 10 inches tall during a period of rapid growth. The following chemicals at rates indicated were applied to square rod plots replicated three times: polychlorobenzoic acid (PCB), 20, 40 lbs/A; 3-amino -1,2,4-triazole, 8, 16 lbs/A followed by plowing after a two week interval; maleic hydrazide (30), 16 lbs/A followed by plowing; 2-chloro -4, 6- bis-(ethylamino) - s - triazine (Simazin), 12 lbs/A; erbon, 1/2, 1 lb/sq. rd.; polychlorobenzoic isomers (Benzac), 40, 60 lbs/A; 2,4,5-T propionic, 4, 8 lbs/A; MCP, 8 lbs/A; 2,4-D Butyric, 4, 8 lbs/A; Benzac (water soluble) 10, 20 lbs/A; potassium MCP, 2, 4, 8, 16 lbs/A; potassium PCB, 2, 8, 16 lbs/A; potassium 2, 4, 5-T, 2, 8 lbs/A; lithium MCP, 8 lbs/A; and lithium PCB, 8 lbs/A.

Of the treatments used polychlorobenzoic acid at 20 and 40 lbs/A, Benzac at 20, 40 and 60 lbs/A, potassium PCB at 16 lbs/A, lithium PCB at 8 lbs/A, and erbon at 1/2 and 1 lb/1 sq. rd. gave 100% control of top growth. Amino triazole at 8 lbs/A followed by plowing, 2,4-D butyric at 4 lbs/A, and potassium MCP at 8 lbs/A also gave excellent control. Addition of wetting agents did not appear to affect the degree of control.

Since climbing milkweed is a deep rooted perennial, the above observations must be considered preliminary; final evaluation of a treatment will not be possible for at least two years. (Contribution of the Kansas Agricultural Experiment Station.)

Johnsongrass and Bermudagrass

Summary

O. Hale Fletchall

All of the abstracts deal with Johnsongrass. Compared to 20 and 40 gal/A, 80 gal/A was not consistently the most effective volume of water carrying dalapon, erbon, or mixtures of the two for Johnsongrass control. The higher volume gave a more rapid kill.

Dalapon at 1/5 lb/gal was more effective than 2/5 lb/gal of sodium 2,3-dichloroisobutyrate as a spray for spot treatment. A compressed air hand sprayer was superior to a gravity flow sprayer for spot treatment. Depressing effects of dalapon and sodium 2,3-dichloroisobutyrate on corn yields were about equal to the benefits from Johnsongrass control.

Three weekly sprayings of 3.7 lb/A each of dalapon followed in one week by plowing gave 99% control of Johnsongrass without apparent injury to wheat planted 4 weeks after the last spraying. Neither MH at 3 lb/A nor ATA at 2 lb/A at each spraying were as effective as dalapon.

Ethyl N, N-di-n-propylthiolcarbamate (EPTC) at 3 lb/A gave virtual control and at 5 lb/A gave complete control of Johnsongrass seedlings. 4 lb/A of 2-chloro-4,6 bis (ethylamino)-s-phenylacetamid (CP6936), CDAA, and a mixture of CDAA and 2,4-D were ineffective.

Johnsongrass has been found in 3 of the southwestern counties of Michigan. Infestations range in age from 3 to 10 years and in extent from ½ to 10 acres.

Abstracts.

A comparison of carrier volumes in applying dalapon and/or erbon to Johnsongrass. Anderson, L. E. Dalapon (2,2-dichloropropionic acid) at 15 and 20 lb/A, and erbon (2-(2,4,5-trichlorophenoxy)ethyl 2, 2-dichloropropionate) at ½ lb/sq. rd. were applied to square rod plots of Johnsongrass (Sorghum halepense) at the 18 to 36 inch stage of growth in volumes of water equivalent to 20,40, and 80 gal/A. The following combinations were also applied at the same stage in the carrier volumes previously mentioned: erbon, ¼ lb. + 10 lbs. dalapon; erbon, ¼ lb. + 5 lbs. dalapon; erbon, 1/8 lb. + 10 lbs. dalapon; erbon, 1/8 lbs. + 5 lbs. dalapon. Applications were made June 19 following a period of abnormally heavy precipitation. All treatments were replicated three times. On the basis of stand counts made August 28 and 29, all treatments with the exception of the combination erbon, 1/8 lb. + 5 lbs. dalapon in 20 and 40 gal/A gave at least 95% control. It was observed that where volumes of 20 or 40 gals. water per acre were used, the kill of Johnson-

grass was extended over a longer period of time. Contrary to expectations, the 80 gallon volume did not consistently give the most effective control. Plots included in the first replication were re-treated September 4 at half the rates used in the original application. Except for the lowest rates of a dalapon-erbon combination, re-treatment gave control of regrowth and seedlings approaching 100 percent. (Contribution of the Kansas Agricultural Experiment Station.)

Spot treatment of Johnsongrass with dalapon and sodium 2,3-dichloroisobutyrate. Fletchall, O. Hale. Johnsongrass in corn was treated with a compressed air hand sprayer on August 5 with dalapon at 1/5 lb/gal and sodium 2,3-dichloroisobutyrate (FW450) at 1/10, 1/5, and 2/5 lb/gal in a wetting spray. Respective kills based on stem counts at corn harvest compared to counts at first treatment were 96,45,49, and 84 percent. Respective corn yields were 75,85,76, and 74 bu/A. The check yielded 76 bu/A. Dalapon at 1/5 lb/A applied with a gravity flow hand sprayer gave 80% control and a corn yield of 79 bu/A. (Contribution of the Missouri Agricultural Experiment Station.)

Effectiveness of 3 translocated herbicides used at low rates in repeated foliage applications followed by plowing for control of Johnsongrass. Freeman, J. F. A third year stand of Johnsongrass which had been mowed each time as it approached flowering stage was used for this experiment. Beginning September 4, 1956 when regrowth following third mowing was 10-12 inches high the first of 3 repeated foliage spray applications at 1 week intervals was made with each herbicide. The treatments made in triplicate were dalapon as the sodium salt 3.7 lb/A (total 11.1 lb); maleic hydrazide (MH) as the diethanolamine salt, 3 lb/A (total 9 lb); 3 amino-1, 2, 4-triazole (ATA), 2 lb/A (total 6 lb); and untreated check. Herbicides were applied in water at 32 gal/A. The Johnsongrass of all treatments was plowed under September 25 a week after third spray application. The soil was disked three times during the interval until winter wheat was seeded October 16. Good stands of wheat resulted and the crop showed no phytotoxic effects of the herbicides previously used. Prior to harvest of the wheat July 5, 1957 the number of Johnsongrass stems on each plot was determined as a measure of the effectiveness of the treatments in destroying rootstocks with results as follows:

Treatment	Active Ingredient lb/A, 3 appl.	No. Plant Stems/300 sq.ft.	% Control
Dalapon	3.7 + 3.7 + 3.7	28	99
MH	3 + 3 + 3	579	75
ATA	2 + 2 + 2	1005	57
check		2324	—

(Agronomy Department, Kentucky Agricultural Experiment Station)

Herbicides used pre-emergence for control of Johnsongrass seedlings. Freeman, J.F. Johnsongrass seed was drilled 3/4 to 1/2" deep in rows 14 inches apart August 2, 1957 for use in this experiment which was a randomized block with three replications. Although the soil was moist at time of seeding continuing dry weather delayed germination of the seed. Plots were treated August 8 2 days prior to good rains. The sprayed treatments were, Ethyl N, N-di-n-propylthiolcarbamate (EPTC) at 3 and 6 lb/A; 2-chloro-4, 6 bis (ethylamino)-s-triazine (Simazin) at 1,2, and 4 lb/A; Alpha-chloro-n-ethyl-n-phenylacetamid (CP6936) at 6 lb/A; CDAA at 4, and 6 lb, and 3 lb + 0.5 lb. 2,4-D as PGBE ester, all applied in water sprays at 32 gal/A. In addition CDAA granular 5% was applied broadcast on the soil at rates to provide 2,4,6 and 8 lb/A active and untreated check. The seeds germinated rapidly following a 2 inch rain on August 10. The number of established seedling plants in the equivalent of 27 ft. of row of each plot was determined Sept. 6. EPTC at 6 lb/A resulted in complete control and at 3 lb/A only 3 plants survived as compared to 215 plants for the check. Simazin at 4 lb/A had 63 plants and at 2 and 1 lb. rates 103 and 201 respectively. At the rates used the other herbicides were ineffective. (Agronomy Department, Kentucky Agricultural Experiment Station).

Extension of the range of Johnsongrass in Michigan. Grigsby, B.H. Infestations of Johnsongrass were found in 1957 in three of the southwestern counties of Michigan. These counties are: Cass, Van Buren, and Berrien. The known ages of the infestations range from 3 to 10 years but positive identification was not made until this year. At each location growth has been slow but steady and now the patches range in size from ½ to 10 acres in extent. Propagation appears to have been by means of both seeds and rhizomes. Studies are now underway to try to determine whether a cold resistant variety has become established or whether climatic factors and soil conditions have been responsible for survival of Johnsongrass outside the normal range for this plant. (Contribution from the Michigan Agricultural Experiment Station).

Quackgrass

Summary

K. P. Buchholtz

A number of trials with dalapon, TCA and ATA showed that control of quackgrass was enhanced when tillage treatments were used in combination with applications of chemicals. Tillage was shown to be especially important with ATA for in one trial application of from 4 to 6 lb/A to quackgrass regrowth, followed by tillage, was equivalent to 20 lb/A applied without tillage. Tillage appeared to have had no beneficial effects when used with monuron or fenuron.

Applications of dalapon and ATA, repeated at various intervals, were more satisfactory than single applications. With dalapon an interval of 1 month between treatments was as satisfactory as 10 days and less chemical was used. Nearly complete elimination of the quackgrass was obtained from several of the repeated applications.

In several comparisons dalapon was superior to TCA or ATA for control of quackgrass when applied as foliage sprays at comparable rates. Combinations of ATA and dalapon gave control that indicated only an additive effect. Soil residual effects were reduced because of the lower rates of dalapon required.

Application of 10 lb/A of dalapon gave good control of quackgrass in shelter belts. Treatment in two successive years gave nearly complete elimination. Spruce was the only species that showed any evidence of sensitivity to the chemical.

Simazin may have promise for the control of quackgrass. In two trials control was obtained at 8 and 21 lb/A. In a third trial only poor control resulted. The high tolerance of corn to the herbicide allowed its use to control quackgrass while a crop was being produced.

Monuron gave longer residual periods than fenuron. Application of 40 to 80 lb/A was required for complete control and allowed no regrowth for 3 years.

Both ATA and TCA were used successfully as spot treatments for control of quackgrass in lawns.

A greenhouse trial gave strong indications that 2,3,6-TBA is only partially effective in controlling quackgrass when applied solely as a foliage spray. The best control of regrowth resulted from soil treatments with the combined soil and foliage treatments being nearly as good. This suggests that soil residue of 2,3,6-TBA is more important than previously reported.

Abstracts

Control of quackgrass and corn yields obtained from plots treated with dalapon, simazin, 2,3,6-TBA and PBA on three dates. Buchholtz, K. P. Dalapon, a preparation predominantly 2,3,6-TBA (HC-1281-S) and a preparation predominantly 2,3,5,6-TBA (PBA) were applied to an old quackgrass sod at 4 lb/A on April 10, April 25 and May 2, 1957. Simazin was applied at the same dates at 8 lb/A. All applications were made in water at 20 gal/A. The April 10 application was made to bare ground for the area had recently been burned. On April 25 the quackgrass was about 4 inches tall and on May 2 about 8 inches tall. On May 8 the area was plowed. Approximately 2 inches of rain fell between the first treatment and May 8, 0.41 inches between the second date and May 8, and none between May 2 and May 8. On May 20 the plots

were planted to W530 corn. Diuron was applied at 1.5 lb/A and 2,4-D at 0.5 lb/A on June 6 to control annual weeds. The area was not cultivated during the season. Counts of quackgrass shoots were obtained on June 17 and the corn was harvested on Sept. 27.

Date of Treatment	Material	Appl. lb/A	Quackgrass shoots per sq. ft.	Corn yield bu/A
April 10	Dalapon	4	54.3**	38.5**
	Simazin	8	27.3**	85.2**
	2,3,6-TBA	4	41.0**	50.8**
	PBA	4	51.8**	46.1**
April 25	Dalapon	4	51.0**	32.1
	Simazin	8	25.3**	77.8**
	2,3,6-TBA	4	52.3**	43.3**
	PBA	4	53.4**	42.3**
May 2	Dalapon	4	52.8**	37.7**
	Simazin	8	60.5**	77.9**
	2,3,6-TBA	4	55.0**	39.9**
	PBA	4	54.8**	42.7**
Check			88.0	22.7
LSD 5% level			13.8	11.4
LSD 1% level			18.6	15.3

The data show no significant differences between the quackgrass shoot numbers from plots treated with dalapon, 2,3,6-TBA or PBA on the three dates. The lack of rainfall between May 2 and May 8 may have contributed to the poor control obtained on the last date of treatment. The control obtained on the first date, while not good, was much better than expected for it was essentially a soil treatment. Simazin was the most effective material tested with the results from the first two dates of treatment being the best. Quackgrass on plots treated with simazin continued to die throughout the growing season.

The corn yields indicate the degree of quackgrass control obtained during the season. Plots treated with simazin gave substantially higher yields than plots treated with other materials. There was a tendency for the plots treated on the first date to have the highest yields with all four materials. None of the plots produced corn that gave any evidence of injury from herbicides. (Dept. of Agronomy, Univ. of Wisconsin, Madison).

Repeated low rates of dalapon for couchgrass control. Carder, A. C. This experiment consists of two parts: one where the dalapon was applied to the couchgrass at approximately 10-day intervals; the other where it was applied at approximately monthly intervals. The initial applications were made in either case in the early summer to a continuous stand of couchgrass when 10-12 in. high. The chemical was applied by boomed plot sprayer using an aqueous solution at the rate of 60 gal/A active ingredient. The plots were appraised one month after the last treatments were made. Procedure and results are described in the table. Data are the averages of duplicate plots.

Date applied	Dalapon lb/A	Percentage topgrowth still living Sept. 20	Remarks
June 17, 26, July 6, 15, 22, Aug. 6, 21	1	10.0	Topgrowth of original plants not entirely dead
	2	3.5	Topgrowth of very occasional original plant not entirely dead
	3	2.5	Topgrowth of original plants dead, but a few small resprouts showing
June 17, July 15, Aug. 21	3	2.5	Topgrowth of original plants dead, but a few small resprouts showing
	4	2.0	Topgrowth of original plants dead, but a few small resprouts showing

Three applications of dalapon at the rate of 3 lb/A and given at monthly intervals were as effective as the same dosage applied 7 times at 10-day intervals. Best topgrowth kill was obtained by 3 applications of the chemical at 4 lb/A given at monthly intervals. Final results will not be known until 1958. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Treatment of couchgrass with CMU alone and combined with tillage. Carder, A.C. A continuous infestation of couchgrass on a shallow black clay loam soil was treated in late spring and early fall of 1952 with CMU (monuron). The late spring treatments were made after about 20 in. of leaf growth was mowed and raked off; the early fall treatments were also made following removal of couch topgrowth. The chemical knapsack sprayed in aqueous solution at the rate of 80 gal/A. Certain treatments were combined with tillage. Procedure and results are given in the table. Data are the averages of duplicate plots.

Treatment	CMU lb/A	Percentage survival and re-establishment of couchgrass after years following treatment									
		Spring treatment					Fall treatment				
		1 yr.	2 yr.	3 yr.	4 yr.	5 yr.	1 yr.	2 yr.	3 yr.	4 yr.	5 yr.
CMU on undisturbed sod	10	15	8	12	8	15	12	5	7	11	22
	20	5	0	2	2	8	4	2	0	2	12
	40	1	0	0	0	0	2	0	0	0	11
	80	0	0	0	0	0	0	0	0	0	1
CMU applied, one-wayed once 5 in. deep 2 weeks later	10	18	40	48	62	80	65	32	38	42	48
	20	10	6	6	8	15	18	14	10	8	8
	40	5	0	0	0	4	12	6	5	5	6
	80	1	0	0	0	1	4	0	0	0	1
One-wayed once 5 in. deep CMU applied	10	28	48	35	82	82	40	48	55	75	80
	20	15	5	2	2	11	32	15	7	10	11
	40	8	1	0	0	2	15	1	0	0	6
	80	2	0	0	0	2	12	0	0	0	1
One-wayed once, 5 in. deep, CMU applied, one-wayed again immediately	10	15	25	20	32	41	40	35	38	48	60
	20	12	8	5	6	11	38	22	25	25	27
	40	5	0	0	0	3	25	14	11	15	11
	80	1	0	0	0	2	16	8	6	8	6

Under the conditions of this experiment CMU was most effective when applied in the spring on undisturbed sod. Applied in this way, as little as 20 lb/A of CMU eradicated the couch, but when tillage was involved this rate of application of the chemical did not result in complete kill. Where 40 lb/A or more were applied in the spring on undisturbed sod, couchgrass has not reappeared on the plots after 5 years, while in every instance where cultivation was involved the weed re-established itself in this time. Fall treatments were generally less effective than those given in the spring. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The comparative effect of dalapon and ATA on couchgrass. Carder, A. C. The initial application of the chemicals was made in mid-June of 1956 when the couchgrass was 8-10 in. high; re-treatments when the couch resprouts were 4-6 in. high. The herbicides were applied by boomed plot sprayer using an aqueous solution at 60 gal/A. The effects of the various treatments were appraised in the early summer and again in the autumn of the year following that when the treatments were made. Procedure and results are described in the table. Data are the averages of duplicate plots.

Tillage treatment	Chemical treatment	Chemical lb/A active ingredient	Percentage survival and recovery: Early summer of year following treatment	Autumn of year following treatment
One-wayed 5 in. deep 2 weeks after the initial Application of chemical	One treatment applied in spring	4 ATA	90	100
		8 ATA	70	100
		12 ATA	51	87
		4 DAL	68	92
		8 DAL	36	82
		12 DAL	36	82
		4 ATA + 4 DAL	50	96
	Spring treatment followed by retreatment at half rates	4 ATA, 2 ATA	85	100
		8 ATA, 4 ATA	76	100
		12 ATA, 6 ATA	70	95
		4 DAL, 2 DAL	56	88
		8 DAL, 4 DAL	22	59
		12 DAL, 6 DAL	10	51
		4 ATA + 4 DAL		
		2 ATA + 2 DAL	67	95
		4 ATA, 2 DAL	90	98
One-wayed 5 in. deep 4 weeks after the initial application of chemical	One treatment applied in spring	4 ATA	100	100
		8 ATA	92	100
		12 ATA	89	100
		4 DAL	82	95
		8 DAL	40	86
		12 DAL	18	75
		4 ATA + 4 DAL	74	94
	Spring treatment followed by retreatment at half rates	4 ATA, 2 ATA	79	81
		8 ATA, 4 ATA	18	44
		12 ATA, 6 ATA	20	36
		4 DAL, 2 DAL	42	88
		8 DAL, 4 DAL	8	44
		12 DAL, 6 DAL	6	38
		4 ATA + 4 DAL		
		2 ATA + 2 DAL	16	44
		4 ATA, 2 DAL	40	95

Under the conditions of this experiment: (1) no treatment eradicated the couchgrass, (2) in all instances the degree of control was increased by increasing the dosage of either chemical, (3) in almost all instances the degree of control was increased by retreatment, (4) wherever retreatments were made better kills of couch were obtained when tillage was delayed for 4 weeks following the initial application of the chemical. Where retreatments were not made however, tillage given 2 weeks after chemical treatment generally produced the best results, (5) dalapon was approximately twice as effective as ATA, (6) the only near kills of couchgrass were obtained when tillage was delayed for 4 weeks after repeat applications of dalapon which totaled to 12 lb/A or more. In these instances the control in the early summer of the year following treatment was greater than 90%, but the few viable root-stalks that remained rapidly re-established infestation so that by the autumn of the same year the infestation had again reached serious proportions, (7) recovery of couchgrass during the 3 summer months of the year following that when treatments were made was generally the same for ATA as for dalapon averaging about 58% over the period, and (8) substituting part of the dalapon dosage with ATA did not give as much control as if dalapon only were used; the opposite generally held true if part of the ATA dosage was substituted by dalapon. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

The comparative effect of PDU and CMU when applied to undisturbed couchgrass sod. Carder, A. C. PDU (fenuron) and CMU (monuron) were applied to undisturbed couchgrass sod in the spring of 1953 at the rates indicated in the table. The chemicals were knapsack sprayed in aqueous solution at the rate of 80 gal/A. The couch was a foot high and at the shot-blade stage when treated. Soil moisture was good in 1953 and 1954, somewhat scant in 1955, fair in 1956 and good in 1957. The effects of the various treatments were appraised from time to time. Data are the averages of duplicate plots.

Material	Appl. lb/A	Percentage survival and re-establishment after years following treatment			
		1 yr.	2 yr.	3 yr.	4 yr.
PDU	20	28	82	98	100
	40	7	10	23	75
	80	2	0.5	0	6
	100	1	0	0	5
CMU	40	6	9	12	29

Eighty lb/A of PDU or more were required to eradicate couchgrass. Three years were required for the process. However, on the fourth year the residual effect of the chemical had diminished to such an extent that couch began to invade from surrounding untreated areas. At 40 lb/A of PDU, couchgrass elimination was approached one year after treatment but recovery set in after that time so that by the fourth year after treatment it was only three-quarters complete. At 20 lb/A this chemical gave only partial kill of couch with rapid recovery after the first year. The long-lasting residual effect of CMU is indicated. Although the degree of kill from CMU was not much different from that of PDU at the same rate much slower recovery of the couchgrass occurred. (Contribution of Experimental Farm, Beaverlodge, Alberta.)

Comparison of amino triazole, dalapon, and TCA as foliage and as soil treatments for couch grass with or without cultivation. Corns, Wm. G. Half of a 100 x 150 ft. area of 2 year old dense couch grass sod at Edmonton was plowed July 6, 1957 and disced 2 days later. The cultivated area and the foliage in the undisturbed half of the area were sprayed on July 9, active ingredients as follows in 100 gal./A water: amino triazole (A.C.P. Weedazol) 15, 30 lb/A; sodium dalapon (Dow) 30, 50 lb/A; sodium TCA (A.C.P. Co.) 60, 100 lb/A. Spring and summer weather was rather dry until late July. The table shows initial and later treatments of the various plots, and final plant counts for the season Sept. 18, 1957 (duplicate plots).

Chemical	Appl. lb/A	No Tillage	Number live plants per square yard: Roto-tilled 7/23	Tilled 8/28	Tilled 7/23	Tilled 7/23, 8/7, 8/17, 8/28
		Foliage treatment with or without tillage afterwards.				
Dalapon	30	0	0	0	0	
	50	0	0	13	0	
TCA	60	70	0	2	0	
	100	113	0	17	0	
Amino triazole	15	437	315	275		203
	30	198	239	320		126
Check		707	324	338		239
		Soil treatment with or without tillage afterwards.				
Dalapon	30	2		3	2[1]	
	50	2		1	1	
TCA	60	22		9	2	
	100	9		3	0	
Amino triazole	15	343		216		113
	30	265		203		63
Check		464		315		248

1/ Plus additional tillage on 8/7.

The main indications from the data are: superiority of dalapon as a foliage spray with or without subsequent tillage; superiority or equivalence to TCA of dalapon, in this case, even as a soil treatment; inadequacy of amino triazole under the conditions of this test; relatively little difference between the results from the two rates of a given chemical. (Division of Crop Ecology, University of Alberta.)

Effect of amino triazole on second growth of couch grass. Corns, Wm. G. Spring growth on a dense couch grass sod was removed on July 8 at pre-heading stage. On July 25 when regrowth was about 6 inches tall, amino triazole (Weedazol) was sprayed on duplicate plots at 0, 5 and 10 lb. active material in 100 gal. water per acre. Half of each 150 sq. ft. plot was roto-tilled twice on Aug. 17 and once Aug. 28. Results: Two weeks after spraying time the treated plants were white or purplish but by Sept. 6 many green healthy shoots were present as shown by the following summary.

Application lb/A	Mean number of shoots per square foot: Undisturbed after spraying	Roto-tilled after spraying
5	42	34
10	27	40
Check	77	42

Neither rate was very effective on either the uncultivated or the cultivated plots. (Division of Crop Ecology, University of Alberta.)

Herbicides for the control of couch grass. Friesen, H. A. Various herbicides were sprayed on established couch grass sod at two stages of growth, viz: (1) on May 23 when the initial growth of couch was 10 inches tall and (2) on June 19, after the couch had begun heading, had been mowed and the regrowth had reached a height of 6 inches. Two weeks after each of the sprayings the couch was plowed and worked down. Only one subsequent tillage was given prior to final assessment on October 2, 1957. Results: Dalapon was the most effective herbicide in this test. Plots treated with dalapon at 20 and 30 lb/A at stage 1 had no regrowth, at the 10 lb/A dosage regrowth amounted to 5% of the original stand. TCA at 50 lb/A had 3% regrowth. ATA at 10, 20 and 30 lb/A had 15, 5 and 0 per cent regrowth, respectively. A mixture of Dalapon and ATA each at 10 lb/A was no more effective than dalapon at 10 lb/A. Simazin at 20 and 40 lb/A had 70 and 50 per cent regrowth; while Benzac at 10 and 20 lb/A had 30% and 8% regrowth, respectively. At stage 2 the patterns of control were similar but all treatments were 5 to 10% less effective than at stage 1.

It is of interest to note that in a further trial with couch on land which had been gardened in 1956 Simazin at both 21 and 27 lb/A active ingredient resulted in 100% kills. Seneca 60 corn planted one month after treatment grew normally while turnips, cabbage, cucumbers, beans, peas and onions were killed. (Contributed by the Experimental Farm, Lacombe, Alberta.)

Soil vs. foliage application of 2,3,6-TBA for quackgrass control. B. G. Johnson and K. P. Buchholtz. On November 27, 1956, one foot square sections of a heavily infested quackgrass sod were cut from the field and placed in a coldframe. On January 15, 1957, the sections were thawed and placed in pans in the greenhouse under favorable growing conditions. All top-growth was removed at the time the sod sections were taken from the field. On February 7, the new growth was clipped back to 4" to provide a uniform height of shoots. By February 26, the average shoot count per pan was 146 and the average shoot heights were 8-10 inches. On this date the treatments were applied. Three methods of application were used and three rates of the chemical were applied in each method. The chemical used was predominantly the sodium salt of 2,3,6-trichlorobenzoic acid (HC-1281-S). The three methods of application were soil treatment, foliage treatment and soil + foliage treatment. The soil + foliage treatment was an overall spray similar to normal field applications. The foliage treatment was an overall spray but with the soil temporarily covered with vermiculite to prevent the chemical from reaching the soil. The soil treatment was made by adding the chemical to a given quantity of water and pouring it on the soil surface, avoiding contact with the foliage. Two weeks after treatment the sod sections were turned over in the pans to simulate plowing. One month after turning, shoot counts were made and after two months the top growth was harvested. All shoot counts and weights are totals of three replicates.

Method of Application	Appl. lb/A	Shoot Counts	Treatment Mean	Weight of Foliage (Wet-gms)	Treatment Mean
To soil (flood)	1	88**		56.6	
	2	14**		25.3**	
	4	1**	34.4**	3.0**	28.28*
To foliage (spray)	1	210		64.5	
	2	192		67.1	
	4	112**	171.3**	55.3	62.32**
To soil and foliage (spray)	1	116**		65.0	
	2	52**		40.7*	
	4	12**	60.0	12.0**	39.21
Check		246		55.6	

The data, as summarized in the table, show that soil + foliage and soil treatment alone are more significantly different from the check than foliage treatment for both shoot counts and weights of foliage. When the treatment means were statistically compared, the standard method of soil + foliage application was used as a basis for comparison. For both shoot counts and weights of foliage, the soil + foliage method was significantly better than the foliage method alone. The soil method alone was significantly better than the soil + foliage treatment. Thus it appears that the chemical shows its greatest effect through the soil, although some effect was obtained with foliage application, and any foliage present tends to lower the effectiveness of the chemical, mainly by interception. (Dept. of Agronomy, Univ. of Wisconsin, Madison. NC-10 Regional Project support.)

Amino-triazole (Weedazol) in controlling quackgrass on non-crop lands, 1955-1957. Pavlychenko, Th. K. For three successive seasons amino-triazole (Weedazol) was applied in Saskatchewan at rates from 3/4 lb. to 20 lbs/A on solid infestations of quackgrass at different dates alone or in combinations with other chemicals: CMU, TCA and dalapon, as well as in combination with cultivations at various intervals after treatment on heavy and light loam soils. Comparisons were also made between different volumes of spray solution from 5 to 60 gal/A.

Results: Single applications without cultivation. I. Rates: (1) 3/4 to 1½ lbs/A - some discoloration, growth stunted, but recovered later in the season; (2) 2 to 5 lbs/A - general discoloration and reduction in stand, but considerable recovery by the end of October; (3) 6 to 8 lbs/A - striking discoloration, over 60 pct. kill, less than 10 pct. survival; (4) 9 to 12 lbs/A - about 90 pct. reduction in stand, some recovery the next season; (5) 13 to 20 lbs/A - only occasional survival the following year. II. Single treatments with cultivations: (1) rates 3/4 to 3 lbs/A - all produced regrowth in the season of treatment and the following year (unsatisfactory); (2) 4 to 8 lbs/A - some regrowth that survived the following season; (3) 9 to 12 lbs/A - occasional survival the following year; (4) 13 to 20 lbs/A - good results with very occasional survival the following year. III. Single treatments of the second growth, 6 to 8 inches high, and cultivated after the top growth showed discoloration: (1) 3/4 to 3 lbs/A - from abundant to scanty survival; (2) 4 to 6 lbs/A - better kill than at 12 lbs/A rates applied to first growth, uncultivated, or 9 to 12 lbs/A cultivated. Spot retreatments were needed only in few cases. (3) 7 to 20 lbs/A - from very occasional to no regrowth. The volumes of spray from 5 to 30 gal/A were showing some patchiness in results apparently due to

incomplete coverage. All volumes above 30 gal/A produced better and uniform results. Of the combinations with other chemicals, mixtures with dalapon followed by cultivation were the best. 4 lbs. of ATA (Weedazol) plus 10 lbs/A of dalapon produced more complete and dependable results than 6 lbs/A of ATA or 20 lbs/A of dalapon separately. In addition there was less residual effect of dalapon on the subsequent grain crops, when it is used alone in excess of 15 lbs/A. The mixtures with TCA and CMU were less desirable because of their strong residual effects upon the subsequent crops. (Contributed by Agricultural Division, American Chemical Paint Company, Saskatoon, Sask.)

Eradication of quackgrass in newly seeded lawns with amino-triazole (Weedazol) 1955-57. Pavlychenko, Th. K. Individual quackgrass plants either from seed or stolons in the newly seeded lawns are of common occurrence. It is almost impossible to eradicate them mechanically or by the known grass killers with contact action, strong soil residues or weak translocation without spoiling the good grass. To find a solution to this costly and annoying problem, experimental work was underway for the last four seasons in Saskatoon with amino-triazole and TCA. The treatments were made the first or second season after the lawns were established and cut several times so that the quackgrass plants or tiny patches could be easily detected and marked. A solution of ½ measuring cup ATA (Weedazol 50 pct.) or ½ lb. of ACP grass killer (TCA 90 pct.) in each gallon of water was used in all cases and applied with a small brush to wet well the base of each individual plant. Under most conditions a good size lawn of 50 x 25 feet was treated in less than 30 minutes.

Results: Both chemicals proved fully effective, unless the plants were missed or poorly treated. The TCA killed the quackgrass plants in about one week's time. After each rain it was leached into the soil both laterally and downward producing bare spots by killing the good lawn grass around the treated plants. Usually these were reseeded successfully in the middle of July the following season after the chemical was sufficiently leached into the greater depth. ATA (Weedazol) acted much slower. The plants first turned white and remained alive for about four weeks. Then they gradually died producing no sprouts. In no case was the adjacent lawn grass injured unless directly touched by the brush during treatments. (Contributed by Agricultural Division, American Chemical Paint Company, Saskatoon, Sask.)

Destroying quackgrass in places inaccessible for cultivation with amino-triazole 1955-1957. Pavlychenko, Th. K. Places where cultivation of any kind is impossible such as stone piles, fence lines in the fields and home gardens, shelter belts, etc., are the focal points from which quackgrass spreads into cultivated grounds both by seed and stolons. For the last four years numerous treatments were conducted in Saskatoon and then at various places in Saskatchewan with amino-triazole, a rapidly translocated compound, to determine its effectiveness on quackgrass under these specific conditions. A solution of 2 oz. per each gallon of water was used in all cases. The plants were sprayed till thoroughly wet, when the weed was near or at the heading stage.

Results: In the fence lines the weed was invariably killed with no regrowth the following seasons. In stone piles, especially where large flat slabs were present some spot retreatments were necessary the following year for complete kill. In the shelter belts special care was taken not to spray the tree trunks, but to wet well the quackgrass between them. Wherever the coverage was good, the weed was killed with no injury to the trees. Of the woody plants present, the lilac bush alone showed some effects on the unsprayed foliage, apparently due to the abundance of fibrous roots close to the surface. In some cases the areas freed of quackgrass were partially overrun by annual weeds even by the end of the season of treatment. (Contributed by Agricultural Division, American Chemical Paint Co., Saskatoon, Sask.)

The effect of dalapon and TCA on couch and brome grass infestations in spruce trees. Selleck, G. S. and R. T. Coupland. The sodium salts of dalapon at rates of 10, 20, 40 and 80 lb/A and TCA at 60 lb/A active ingredient were applied to couch and brome grasses in 100 sq. ft. duplicated plots June 6, 1956. The grasses were 18 in. high and in the shot-blade stage. The edges of the plots were located within 2 ft. to 5 ft. from trunks of spruce trees and the branches often extended over the plots. Dalapon at a rate of 40 lb/A was applied adjacent to and around one tree. A second application May 28, 1957 included all plots except the 80-lb. rate of dalapon. A slight browning at the tips of the needles was observed in August, 1957 after the second application of dalapon adjacent to and around the trunk. Damage was not evident to any of the other trees. The percentage control of grass (based on visual estimates) is presented in the following table.

Herbicide	Rate lb/A	Percentage control		
		Sept. 21 1956	May 28 1957	August 15, 1957 (after second treatment)
Dalapon	10	15	15	82
"	20	45	45	72
"	40	25	47	75
"	80	97	95	58*
TCA	60	17	37	82

*Plots received one application only.

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Annual and Winter Annual Grass Weeds

R. S. Dunham

Summary

The interest in wild oats continues. Thirty-two of the 42 abstracts submitted for this section report studies on control of this weed. Chemical methods were used in 24 trials, cultural methods in 8. All but four of the reports on wild oats came from Canada.

The outstanding chemical used for wild oat control this year was EPTC. Only one failure in 7 trials was reported. Results were either good or excellent. Satisfactory rates varied from 2 to 15 lb/A. Injury to crops, however, occurred frequently. Flax, field peas, and certain vegetables showed most tolerance; carrots, cucumbers, barley, and wheat were very susceptible to injury.

CDAA proved very erratic. In 18 trials, results with wild oats were excellent in 4, good in 6, fair in 3, and poor or a complete failure in 5. The explanation is not found in rates, since excellent control resulted from 3 lb/A and failure from 8 lb. Incorporation with the soil was not always better than pre-emergence applications or vice versa. The reports are not all sufficiently descriptive of environmental conditions to permit conclusions but personal observations suggest that CDAA works best under warm temperatures and fails even to kill Setaria spp. under cool conditions. Although moisture supply may sometimes be a factor, it has not proved a dominant one in these observations. Injury to wheat, barley, sugar beets, and some vegetables was reported at rates from 3 to 8 lb/A. In some trials the granular CDAA was markedly more effective on wild oats than the liquid but in others there was no difference. Where effectiveness was greater, selectivity was less.

Reports on a new herbicide, Dow M-757 (1,2,4,5-tetrachlorobenzene), were made by 9 investigators. Control of wild oats was described as excellent in one trial, good in 2 trials, and fair (from 40 to 50%) in the remaining 6. Rates varied from 2.5 to 30 lb/A. Most reports indicated that successful control of wild oats was accompanied by injury to wheat, oats, and barley, but flax showed considerable tolerance in some trials. Carrots were especially sensitive.

Excellent results with IPC and CIPC were reported again by several Canadian workers at rates of 3 to 4 lb/A. Where used on sugar beets there was no injury to the crop. At Fargo, dalapon at 7 ½ lb/A controlled both wild oats and Setaria without injury to sugar beets.

Cultural methods for control of wild oats have been investigated in Canada. Some trials have continued for 4 or 5 years. In general, results have been as follows: Delayed sowing of barley has been the most effective control but yields of the barley have been seriously reduced. Sowing at 3 bu/A and fertilizing have minimized the loss. Fertilizing early-sown barley increased the yield of both crop and wild oats. Fall disking of grain stubble stimulated germination of wild oats, especially on burned stubble. Spring disking before an early-sown crop was ineffective. Burning stubble without working the soil was also ineffective. Tillage with a rod-weeder after sowing a grain crop did not result in better control consistently.

EPTC was considered effective on foxtail in three reports from Canada and one from Minnesota. In two other Minnesota trials, it gave only early control. Dow's M-757 was generally ineffective on foxtail. TCA was used successfully to

control foxtail in sugar beets as reported by Sexsmith. CDAA injured the beets at rates adequate for control. As little as ¼ lb of dalapon or 1 lb of TCA was sufficient for excellent foxtail kill in Canada. In general CDAA was erratic but, again, results seemed to be associated with the temperature at time of spraying. In an experiment to determine the relative tolerance of green foxtail at different stages of development, Friesen found that 1.35 lb/A of TCA gave 95% control when applied pre-emergence but 5.8 lb were required when the plants were beginning to head out. When fully headed, the plants were not killed by 8 lb/A.

In a study of the effect of crop sequence on yellow foxtail, Kommedahl found that "On a unit area basis, the calculated seed yield was about the same for foxtail in flax after flax or oats." Harrowing onceebefore emergence of wheat and once after emergence but before the crop was 2 in tall has been the best cultural practice for the control of green foxtail in 3 years of experience at Brandon, Man.

Ureabor, Chlorea, erbon, monuron, diuron, and simazin were used effectively on irrigation laterals to control foxtail, wild barley, downy bromegrass, wild rye, kochia, and pigweed. Best kills of volunteer sorghum in Texas resulted from MH without wetting agent.

Abstracts

IPC (isopropyl-N-phenylcarbamate) as a soil treatment for control of wild oats. Brown, D.A. Treatments began in 1954 on plots laid out for a three-year rotation of wheat, barley, fallow. Each autumn wheat stubble is treated for barley the following year, while the treated barley stubble lies fallow throughout the succeeding summer. One-half of each plot of crop is seeded at the normal date (May 7), and the other half at a delayed date (June 7).

Results - 1957

Treatment per acre	WHEAT				BARLEY			
	Seeded May 7		Seeded June 7		Seeded May 7		Seeded June 7	
	Stems sq yd	Yield bu/A	Wild oat Stems sq yd	Yield bu/A	Wild Oat stems sq yd	Yield bu/A	Wild oat stems sq yd	Yield bu/A
IPC 5 lb	243	33.4	32	30.4	52	24.7	22	23.8
" 10 lb	247	35.8	36	30.8	50	27.0	24	18.3
" 15 lb	162	34.7	45	30.0	36	23.3	24	16.1
Check	378	30.9	85	25.0	189	32.0	39	20.8

The plot area is heavily infested with wild oats. After the lapse of 18 months following treatment, wheat on fallow grows normally but the reduction in wild oats has not been statistically significant except at the 15 lb/A rate. In 1956, barley seeded early failed to grow but in 1957, following an open winter with scant snow cover the early seeded crop was almost equal to that on the untreated soil. The reduction of wild oats in the barley crop due to IPC was highly significant at the early seeding date. In general wild oats were well controlled by tillage prior to seeding late crop but in crops seeded at both dates the presence of the weed was significantly higher on the check plots. (Contribution from the Experimental Farm, Brandon, Man.). Approved for publication.

Herbicidal treatment of soil for control of wild oats. Brown, D. A. Exp. A. Randox was applied at 2, 4 and 6 lb/A in both liquid and granular form to soil on which barley and flax crops were seeded one day after treatment. The chemical was worked into the soil by three methods, (1) roto-till once, (2) disc

twice and harrow, (3) no after tillage. Crop was drilled in with an Allis-Chalmers double disc All-crop seeder. Results: There was no mathematical difference in the methods of working the material into the soil. The effectiveness of the Randcx on wild oats and the yield of barley in bu/A are given in the following table.

Treatment	Effectiveness	Yield of barley
Liquid 2 lb/A	Inadequate	39
" 4 "	Reasonably good	42
" 6 "	" "	41
Av of all rates *	6.8 in barley 24 in flax	
Granular 2 lb/A	Effective	47
" 4 "	"	41
" 6 "	Very good	29
Av of all rates	3.6 in barley 14.5 in flax	
Check	10.7 " " 64.4 " "	41

* No. wild oat culms/sq yd in crop prior to harvest

Rates of application showed significant differences. Flax was seriously reduced by disease and no mathematical differences were shown in yields in relation to any combination of factors. Yields were actually lower on check plots but this obviously was due to the higher infestation of weeds on these plots. The control of wild oats by Randox was irregular. Certain plots, particularly those receiving the granular form at 4 and 6 lb/A were rendered almost free of the weed but other replicated showed only poor to fair control.

Exp. B. Randox was applied at 4 and 8 lb/A in both liquid and granular form and Dow 757 at 15 and 25 lb/A in granular form to wheat stubble badly infested with wild oats three weeks before seeding barley. The chemical was worked into the soil by (1) cultivating once (2) cultivating twice (3) tandem disc once (4) no after tillage. Packing was compared with no packing in each case. Counts of wild oats plants were made on the day prior to seeding barley. The plot area was then uniformly cultivated and harrowed, the barley seeded and then the number of culms of wild oats sq yd were counted before the barley was harvested. Counts at the latter date are reported in the following table.

Treatment	No. wild oats culms/sq yd	Yields of barley in bu/A
Liquid 4 lb/A	2.9	18
" 8 "	1.6	12
Granular 4 lb/A	2.1	6.8
" 6 "	1.9	3.2
Check	7.8	24
M-757 15 lb/A	5	6.7
" 25 "	3.7	2.9
Check	8.4	25.6

No difference appeared among the methods of working the chemicals into the soil and packing appeared to have no influence in results. (Contribution from Experimental Farm, Brandon, Man.). Approved for publication.

Cultural control of wild oats. Brown, D. A. Barley is seeded on two dates approximately May 8 and June 8. In 1957 the fourth successive crop was grown on land originally moderately infested with wild oats. The results in 1957 indicate the progress made over a four-year period in controlling wild oats by cultural means.

Results:	1957			1954		
Date seeded &	Wild oat culms /sq yd	Yield clean barley bu/A	Cal.* Total Yield W. Oats bu/A*	Wild oat culms /sq yd	Yield clean barley bu/A	Calculated Total Yield . Oats bu/A
Exp. A						
Seeded early (post seeding rod weed)	102	18.6	12.2	112	59.0	13.2
Seeded early (no post seeding till)	364	13.4	43.7	99	59.5	12.4
Seeded late(post seeding rod weed)	6	14.5	.7	44	40.8	.2
Seeded late(no post seeding tillage)	19	14.4	2.3	9	39.5	.6
Exp. B						
Early seeding.						
1 ½ bu.seed fert.	234	25.4	24.8	19	67.8	2.3
1 ½ " "not fert.	293	18.9	31.0	26	66.5	2.6
2 ½ " " fert.	136	30.3	13.9	24	61.4	2.6
2 ½ " "not fert.	148	19.8	15.2	9	64.6	1.1
Late Seeding.						
1 ½ bu.seed fert.	10	13.1	1.2	4	35.3	.3
1 ½ " "not fert.	12	9.5	1.4	3	32.6	.2
2 ½ " " fert.	.7	18.4	.08	3	39.7	.2
2 ½ " "not fert.	11	13.4	1.3	3	41.7	.2

* 34 lb/bu Cal.=Calculated.

Date of seeding has been the most important factor. Early seeding repeated four years has built up an extremely heavy infestation of wild oats whereas repeated late seeding kept the soil relatively free of this weed. Rod weeding prior to emergence of the crop showed little advantage until 1957. Fertilizer increased the yield of barley but did not reduce the incidence of wild oats. (Contribution from Experimental Farm, Brandon, Man.). Approved for publication.

Control of green foxtail by tillage. Brown, D. A. Methods for the control of this weed have been used in conjunction with the growing of a wheat crop on land heavily infested with the foxtail. The third successive crop was grown in 1957. In preparation for the crop stubble land was fall ploughed and all plots uniformly prepared for seeding by cultivator and harrows. The comparative treatments are given after wheat is seeded. Results: percentage control of the green foxtail was as follows in 1957: - rod weed before emergence of crop 17%; harrow before emergence of crop 27%; harrow after emergence of crop 32%; rod weed before emergence plus harrow after emergence 29%. In plots seeded three weeks later than the normal date of seeding the control by rod weeding before emergence plus harrowing after emergence increased to 38% but delayed date of seeding, making possible the killing of much foxtail before drilling the crop, in itself gave 31% control of the weed. In the three years of work at Brandon, harrowing, preferably once before emergence of the crop and once after emergence but before the crops is two inches high has proved the best cultural practice for the control of green foxtail. Efficiency of any of these methods particularly rod weeding depends greatly on seasonal conditions. The control in 1956 was, on the average of all treatments, 100% better than in 1957. (Contribution from Experimental Farm, Brandon, Man.). Approved for publication.

Control of wild oats by the use of CDAA. Carder, A. C. On May 13, 1957, CDAA was applied by boomed plot sprayer at 2, 4 and 8 lb/A active ingredient to summerfallow land fitted for seeding and heavily polluted with a natural infestation of wild oats. The chemical was applied in aqueous solution at 10 gal/A. Sudden rain following application of the chemical prevented its incorporation by tillage until 3 days later. Four tillage methods were used: double one-waying, double one-waying and packing, double discing, double discing and packing. In addition, there was a tillage check where no mechanical incorporation of the chemical was made. The experiment involved four crop seedings: flax and barley seeded immediately following the incorporation tillage and barley seeded one and two weeks after. Also included in this series were drill strips where no crop was sown.

Results: Using wild oat panicle counts to determine the effectiveness of the different chemical and tillage methods, the following conclusions were drawn: (1) CDAA did not give practical control. On the basis of 4 different tillage methods for incorporation, 2 lb/A of the chemical reduced the number of wild oat panicles per sq yd from 44.0 to 35.4; 4 lb/A reduced the number from 49.8 to 46.5; and 8 lb/A reduced the number from 44.0 to 20.9. (2) The method of incorporating CDAA did not influence its effectiveness. Packing after incorporation produced no additional benefit. (3) On those plots receiving CDAA but no tillage the number of wild oat panicles was twice as great as where the chemical was incorporated by tillage. However, this relationship also held to a considerable degree for the series of plots receiving no chemical, indicating that the different tillage methods had in themselves a marked suppressive effect on wild oat panicle number. All plots considered, chemical without mechanical incorporation reduced the count from 96.2 to 74.6. (4) Crop competition was a major detriment to the growth of wild oats. Where no crop was sown there were 160.5 wild oat panicle per sq yd, but where flax was grown there were only 73.5, while where barley was grown there was an average of 15.3 with very little difference induced by different dates of seeding. The addition of chemical lowered the panicle count but did not change the relationship. Thus, where no crop was sown 121 panicles were produced per sq yd, while where flax and barley were grown the count was 56.2 and 11.5, respectively. Plots receiving neither chemical nor tillage produced 207.7 panicles to the sq yd. (Contribution of Experimental Farm, Beaverlodge, Alberta). Approved for publication.

Control of wild oats in flax. Duncan, D. A. Randox (CDAA) in liquid and granular form was applied at 0, 4 and 8 lb/A on May 16. One-half of the plots (6½ X 24') was disced and harrowed before application and the other half received no cultural treatment. The chemical was applied by means of a small plot sprayer, and the flax crop was seeded with a standard seed drill. Weed counts per sq yd were taken on July 24, to determine the percentage control. There was no significant difference between the liquid and granular forms, and also between the cultural treatments. Applications of 8 lb/A gave significantly better control of wild oats, but also, greatly reduced the stand of flax. (Contribution by Illustration Stations, Experimental Farm, Brandon, Man.). Approved for publication.

The effect of several new herbicides on wild oats (Avena fatua) under different soil conditions. Friesen, G. CDAA, EPTC, FW-433, CP-13042 and CP-6840 were applied as pre-planting treatments at 5 locations in the province. Fields selected were known to be heavily infested with wild oats and were representative of the major soil types in Manitoba. Herbicides were applied at 1/2 to 8 lb/A active ingredient in 30 gal total solution per acre, using a variable dosage sprayer. Treatments were conducted in duplicate at each location.

Results: The locations, soil types, and minimum herbicidal dosages required to give satisfactory wild oat control are presented in the following table:

Location	Soil type	Method of incorporation	Dosage required to give 95% control of wild oats (lb/A) EPTC*	CDAA
Winnipeg	Riverdale silty clay	rototiller	2.15	2.90
Glenboro	Stockton sandy loam	oneway	1.80	8.00**
Dauphin	Dauphin clay	wide-level discer	3.00	3.40
Swan River	Valley clay loam	wide-level discer	3.30	5.50
Morris	Osborne clay	tandem disc (twice)	3.20	8.00**

* Differences between EPTC rates are not significant.
** 8 lb/A was highest dosage used and failed to give satisfactory control.

The consistency of EPTC under the different conditions is evident. CDAA on the other hand gave varying results being satisfactory at Winnipeg and Dauphin but unsatisfactory at Glenboro and Morris. The other herbicides: FW-433, CP-13042, and CP-6840 failed to give any measure of wild oat control at all locations and rates.

Crops seeded at the different locations varied. Dosages tolerated by various crops at different locations are presented below.

	Wheat	Barley				Flax	
	Winnipeg	Winnipeg	Dauphin	Swan River	Glenboro	Winnipeg	Morris
EPTC	.90	1.37	3.00	1.60	4.30	6.55	4.60
CDAA	2.32	2.34	3.00	6.28	8.00+	6.00	8.00+

It will be noted that EPTC was very toxic to wheat and barley and selectivity would obviously not be possible by pre-planting treatments in these crops, Flax however, showed a high degree of tolerance. CDAA showed some damage to wheat and barley at rates required to control wild oats. Therefore selective wild oat control in these two crops would be hazardous. Flax showed considerable tolerance.

It is interesting to note that on the heaviest soil (Osborne clay) and lightest soil (Stockton sandy loam) CDAA was equally ineffective. Soil moisture and temperatures were favorable at both locations. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Comparison of oil and water as carriers for IPC and CDAA. Friesen, G. IPC and CDAA, each at 3 lb/A active ingredient, were applied as preplanting treatments to sugar beets on wild oat infested land. The amount of diesel fuel in the carrier varied from 1/2 to 8 gal/A using a variable dosage sprayer. Total volume of spray solution was constant at 30 gal/A and consequently the amount of water varied from 22 to 29 1/2 gal/A. Four replications were used and herbicidal treatments were incorporated with a rototiller to a depth of 2-3 inches. Results: It was apparent throughout the season that IPC resulted in satisfactory control of wild oats regardless of the amount of diesel fuel in the carrier. In the CDAA treated plots, visual observations indicated an increase in wild oat numbers with a decrease in diesel fuel, and it was thought that possibly diesel fuel enhanced the activity of CDAA. However, counts on wild oats indicated that the wild oat followed a similar trend in the check plots. It is therefore concluded that in this particular test diesel fuel did not increase the effectiveness of CDAA or IPC. Wild oat counts for several levels of diesel fuel are presented in the following table:

Gal diesel fuel per acre in carrier	Wild oat culms/sq yd (Av of 4 reps) IPC 3 lb/A	Check no oil or IPC	CDAA 3 lb/A	Check no oil or CDAA
8.0	1.25	7.00	4.75	9.00
5.8	.75	9.75	4.75	8.75
4.0	0	12.00	4.00	12.50
2.7	.50	7.50	3.00	6.50
2.0	.50	5.25	3.25	4.25
1.4	1.50	19.50	10.50	19.00
1.0	1.00	25.50	11.75	26.25

Yield and sugar data on sugar beets are not yet available but visual observations did not show any damage. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Effect of M-757 (1,2,4,5-tetrachlorobenzene) on wild oats. Friesen, G. M-757 was applied as a preplanting treatment to a wild oat infested area at Winnipeg. The herbicide was applied dry with a Gandy Spreader on May 10, 1957. Fairly uniform spreading was obtained at rates of 15, 20, and 30 lb active ingredient per acre. The plots were immediately rototilled to a depth of 2-3 inches. Selkirk wheat, Parkland barley, and Raja flax were sown at two dates after treatment: May 11 and May 25. Treatments were conducted in duplicate. Results: Average wild oat counts taken on July 23. Of interest were the average wild oat counts in the various crops.

Treatment	Wild oat culms/sq yd (av of 9 counts per plot)	Crop	Wild oat culms/sq yd (av of 6 counts per crop)
Check	266	Wheat	212
M-757 15 lb/A	177	Barley	112
" 20 "	136	Flax	266
" 30 "	208		

Although all treatments significantly reduced the wild oat populations, even the best treatment (20 lb/A) resulted in only about 50% control.

The competitive effect of barley is very evident. Yield data of crop plants were not taken because of severe lodging in date 1 and virtually no crop survival at date 2. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

The effect of TCA on green foxtail at different stages of growth. Friesen, G. The use of sodium TCA for the control of green foxtail (Setaria viridis) in flax and several other crops is now an accepted farm practice. The recommendations for its use are somewhat obscure and read as follows: "TCA at 4 to 6 lb/A should be applied when the foxtail is in the early seedling stages before it has developed four leaves!" Apparently little information is available regarding the susceptibility or resistance at other growth stages. The objective of this project was to determine the dosage of TCA required to give satisfactory control of green foxtail at different growth stages. The use of a variable dosage sprayer made such a test feasible. The sodium salt of TCA at rates continuous from 1/2 to 8 lb/A, acid equivalent, was sprayed at approximately one week intervals. A green foxtail infested area at Winnipeg was used for this test and seeded to flax on June 5.

Results: The dates of spraying, stages of weed growth, and minimum dosage giving satisfactory (at least 95%) control are presented in the following table:

Date of spraying	Stage of foxtail growth	Dosage of TCA (acid equivalent) giving required control (lb/A)
June 13	pre-emergence	1.35
" 21	1/2 -1 in. 1-3 leaves	2.70
July 2	1-2 1/2 in. 2-4 leaves	2.95
" 12	2-4 in. 4-5 leaves	3.10
" 17	6-8 in. trace of heads	5.80
" 23	10-16 in. fully headed	8.00+

It will be noted that the dosage required to give satisfactory control in this particular test increases progressively as growth advances. When the foxtail was fully headed even 8 lb/A failed to give a satisfactory measure of control.

Yield data on flax have not yet been determined and may be reported in 1958 (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Control of green foxtail (Setaria viridis) with TCA (trichloroacetic acid) and dalapon (2,2-dichloropropionic acid). Keys, C. H. An area of wheat stubble uniformly infested with green foxtail was sown to flax early in June. On June 27, when the flax was approximately 3 inches tall and the foxtail ranged from the seedling to 5 and 7 leaf stages, replicated, randomized plots 10' x 18' were treated with TCA at 1, 2, 4 and 6 lb/A and dalapon at 1/4, 3/8, 1/2, 3/4, 1 and 1 1/2 lb/A. Two untreated or check plots were included in the test. All treatments were applied with water at 12 gal/A and a blanket application of 4 oz/A of 2,4-D amine. Results: All treatments were very effective for the purpose. At the lowest rate of each chemical (1/4 lb/A-dalapon and 1 lb/A-TCA) less than 1% of green foxtail remained. Only the 6 lb/A rate of TCA and 1 1/2 lb/A rate of dalapon reduced yields of flax below that of the check plots. The average yields were as follows: (yield in bu/A in parentheses) dalapon-1/4 lb (3.6), 3/8 (3.2), 1/2 (2.4), 3/4 (2.4). 1 (2.2), 1 1/2 (1.7); TCA- 1 lb (2.4), 2 (3.2), 4 (3.6), 6 (1.9), average check (2.2). (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.) Approved for publication.

Cultural control of green foxtail (Setaria viridis). Keys, C. H. Seven duplicated post-seeding cultural treatments were applied to wheat stubble for the control of green foxtail. Pre-seeding tillage was uniform and consisted of ploughing packing and seeding with a press drill.

Seeding time	Treatment	1957 Yield of wheat Bu/A	1957 Weed score % of check	Av 1955-57 Yield of wheat Bu/A	Av 1955-57 Weed score % of check
Normal	Pre-em. rod weeder	11.5	83.0	13.6	96.5
"	Pre-em. harrow	11.1	81.0	13.6	97.8
"	Post-em. harrow	10.5	69.0	16.7	74.6
"	Pre-em. rod weeder + " " harrow	11.5	69.0	16.4	79.2
"	Check	12.5	100.0	15.2	100.0
Delayed	Check	9.1	83.0	17.2	79.0
Delayed	Pre-em. rod weeder +Post-em. harrow	9.8	100.0	16.4	97.0

All weeds were short and generally lacked vigor due to the dry conditions during June and July. Treatment number 3 has been the most successful over the past three years of testing as the figures above indicate, but the degree of control was still relatively low. Delayed seeding without further treatment has provided better control than when followed by post-seeding tillage. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.) Approved for publication.

Ecological effects of different preceding crop plants on yellow foxtail in flax. Kommedahl, Thor and Linck, A. J. At Rosemount, Minnesota, yellow foxtail (Setaria glauca) was studies in plantings of flax that followed plantings of corn, oats, wheat, flax or soybeans. Plants were harvested from 2 square yards of each of 4 replicates. The number of foxtail plants, height of the plants, and number and length of heads were recorded. Results: Foxtail comprised the highest percentage (54) of the total plant population (crop plus weeds) in flax after oats and lowest (40) in flax after flax. However the average height of foxtail plants was lowest in flax after oats (48.7 cm) and highest in flax after flax (68.7 cm). The number of heads per foxtail plant averages 1.6 in flax after flax and 1.2 - 1.3 in flax after other crops. The head length of foxtail was longest in flax after flax (5.7 cm) and shortest in flax after oats (4.2 cm). Dry weights per foxtail plant were highest in flax after flax (1.16 gm) and lowest in flax after oats (0.67 gm) and corn (0.65 gm). Data for flax after soybeans approached those from flax after flax while data from flax after corn or wheat approached those from flax after oats. Thus while foxtail plants were more numerous in flax after oats (559 plants/sq yd) than in flax after flax (272 plants/sq yd), they were shorter in height and head length and produced fewer seeds per plant. On a unit area basis, the calculated seed yield was about the same for foxtail in flax after flax or oats. (Contribution of Dept. of Plant Path. and Botany, Univ. of Minn., St. Paul, Minn. Paper No. 3829, Sci, Jour. Series, Minn. Agr. Exp. Sta.)

Preplanting chemicals for wild oat control. McCurdy, E. V. Dows M 757 (1,2,4,5-tetrachlorobenzene) was applied at 5, 10, 12.5 and 15 lb/A active ingredients in early July to a field of summer-fallow with a known severe wild oat infestation. This field had grown a crop of flax in 1956. It was one-wayed twice as soon as the chemical was applied and then packed. Very few wild oats grew in either the checks or the treated plots but a marked difference was noted in October in the amount of weed cover and flax on some of the plots. Results: All checks had a fairly uniform number of flax plants but with the increasing rate of the chemical the flax decreased. At the 15 lb/A rate the plots were almost free of this crop. Grass weeds numbered 36 per plot in the check, 23 in the 5 lb/A application and averaged 8 for the other 3 rates. A marked break in the amount of plant growth appeared between the 5 lb/A and the 10 lb/A rate. Viability tests have not been carried out yet on the wild oats taken from soil samples.

In another test M 757 at 15 lb/A was incorporated with the rototiller, by one-waying once and also one-waying twice. One- waying twice gave the best weed control, was slightly superior to the rototiller and much superior to one operation with the one-way.

In October 1956 M 757 was incorporated into replicated strips at 7.5, 10 and 15 lb/A active ingredient and the same test was repeated this spring. Flax was sown on all plots a few weeks later. The fall application was more satisfactory than the spring. At 7.5 lb/A wild oats were not materially reduced, at 10 lb/A in the fall the control was quite satisfactory but the spring application was not. Very few wild oats showed up in the plots that had received either a spring or fall application at 15 lb/A (Contributed by the Experimental Farm, Indian Head, Sask.). Approved for publication.

Preplanting chemicals for wild oat control. McCurdy, D. V. Randox was applied to replicated plots at 2, 4 and 8 lb/A active ingredient in the liquid form and 4 lb/A in the granular form. Each plot was divided into sub-plots and the chemical was incorporated with the rototiller, the one-way disc, or the double disc. Half of each sub-plot was packed. Wheat and flax were sown immediately after the chemical was incorporated in the soil, and wheat was also sown one and two weeks later. Results: Differences in wild oat control resulting from the three methods of incorporation were not apparent. Where plots had been rototilled a greater reduction was evident but this applied to the checks as well as the treated plots. Packing did not increase the effectiveness of the chemical. In order to determine injury to the crop, yield data were recoreded from all plots. The delay in seeding wheat was not necessary except at the 8 lb/A rate. At this rate the reduction in yield was approximately 20% for the first 2 dates but at the third date the yield of the treated plots was the same as the check, indicating less injury with the delay. The number of wild oats was not reduced in the plots receiving 2 lb/A but at 4 lb/A of the liquid formulation a 16% reduction occurred, with 4 lb/A granular a 33% reduction, and at 8 lb/A a 47% reduction. This chemical could not be considered too effective under the conditions existing in 1957, because of the number of wild oats that were still left in the plots, even at the highest rate used. (Contributed by the Experimental Farm. Indian Head, Sask.). Approved for publication.

To determine the effect of fall tillage on the germination of wild oats. McCurdy, D. V. Plots with a known severe infestation of wild oats have been sown to barley continuously for the past 3 years. They receive 6 different treatments; disk in early fall (about September 20), disk on October 5, disk on October 20 (late fall), disk in late fall and again in early spring, no work in fall and work in early spring, and work just prior to seeding. Because of weather conditions in the fall of 1956 the late fall operation could not be carried out, hence three groups of plots were disked as soon as possible this spring. Square yard plant counts were taken just before seeding. The plots that had been disked early last fall and those that had no work until just before seeding had a much denser growth of volunteer grain and wild oats than any of the other plots. Results: Wild oat counts were taken just before harvest. For early fall work the count/sq yd averaged 16; for the short delay amounting to approximately 3 weeks, 13; for the next 3 groups that were disked early this spring, 36, 37, and 51, and for the group that was worked just before seeding, 38. This indicates that there was a very definite benefit from cultivation in the fall of 1956. These results are similar to those obtained in the same project the previous year. (Contributed by the Experimental Farm, Indian Head, Sask.). Approved for publication.

To determine the effect of stubble cover on the germination of wild oats. McCurdy, D. V. A normal stubble cover was handled in 8 different ways: 2 plots in each replicate were left with the normal stubble; 2 had the cover increased to 2 tons per acre and 2 were burned in the fall. One of each group was disked in the fall and the other was left unworked. The other 2 plots had 100 and 200 lb/A of cyanamid applied in the fall and were worked later. Plant counts were taken this spring on the plots to be summerfallowed. Results: In all cases, a much greater number of wild oats germinated where the plots had been worked in the fall. This was most apparent on the plots that were burned, where unworked only 2 plants were growing/sq yd compared to 54 for the worked plots. The number of wild oats in the crop did not vary greatly between treatments but the plots with the very heavy combine stubble had the highest count and the plots that had been burned and then cultivated, the lowest. Where the stubble was burned off the plots and these plots were left unworked in the fall, the wild oat count was almost the same as the check. (Contributed by the Experimental Farm, Indian Head, Sask.). Approved for publica

The effect of some tillage practices on the number of wild oats in the crop. McCurdy, E. V. The rotation used in this project consists of summerfallow, wheat and barley. The effect of post seeding tillage (the use of the rod weeder) and delayed seeding were compared with the summerfallow wheat, and fall tillage, post seeding cultivation and delayed seeding with the stubble barley. Results: The wheat sown at the normal date and receiving no post seeding cultivation had 89 wild oats/sq yd. Post seeding cultivation reduced this number to 28. With delayed seeding and no post seeding cultivation the count was 14 and delayed seeding and post seeding cultivation, 10. Little difference was noted resulting from the three treatments applied to the stubble barley, except that the average wild oat count/sq yd for all treatments sown at the normal date was 13 and for delayed seeding 1.8. (Contributed by the Experimental Farm, Indian Head, Sask.). Approved for publication.

The effect of some cropping practices on the number of wild oats in the crop. McCurdy, E. V. In this project barley was sown at 2 dates, at 2 rates and half the plots received 50 lb of 11-48-0 and the others were unfertilized. The effect of these treatments was studied from the standpoint of yield and the number of wild oats in the crop. Results: The wild oat count for early sowing at 1 1/2 bu/A was 60; when the rate was increased to 3 bu it dropped to 49. For 1 1/2 bu/A fertilized it was 55 and at 3 bu fertilized it was 48. With the same treatments for delayed sowing, for 1 1/2 bu/A and no fertilizer the count was 22/sq yd; 3 bu/A and no fertilizer, 14; 1 1/2 bu/A fertilized, 15; and 3 bu/A fertilized, 10. From the light rate of sowing at the early date with no fertilizer to delayed sowing with the heavy rate and the use of fertilizer the count dropped from 60 plants/sq yd to 10. Yield data are not available on this project this year. (Contributed by the Experimental Farm, Indian Head, Sask.). Approved for publication.

Pre-planting treatments with CDAA. Molberg, E. S. and Leggett, H. W. CDAA was applied in liquid form at rates of 2, 4 and 8 lb active ingredient in 10 gal water/A, and in granular form at 4 lb/A to land infested with wild oats. Four machines were compared for incroporating the chemicals into the soil. These were rototiller 3-4 in deep, spring tooth harrow 4 times at 3 in depth, oneway disc twice 3-4 in deep, and tandem disc twice at 1-2 in deep. The effect of the packer after incorporation was also tested. Flax was sown on the land immediately after treatment. Barley was sown on three dates, the first immediately after treatment, and the other two dates at succeeding weekly intervals. The test was not replicated, but a check plot was left adjacent to each treated plot. Results - Rates: The 2 and 4 lb rates were too light for effective wild oat control. Results were inconsistent with the 8 lb rate, but the wild oats was reduced by an average of 68%. Formulation - The liquid formulation was slightly better when incorporated, but the granular form was slightly better when not incorporated into the soil. The 4 lb rate was used in this comparison, which was too light for good control. Incorporation - Shallow incorporation with the tandem disc or spring tooth harrow gave better control than deeper tillage with the oneway disc or rototiller. Packing - On the whole packing improved results slightly, although it was detrimental in some instances. Effect on crops. No effect was observed on any of the crops. (Contributed by the Experimental Farm, Regina, Sask.) Approved for publication.

EPTC for wild oat control in flax. Molberg, E. S. and Leggett, H. W. Ethyl N,N-di-n-propylthiol-carbamate (EPTC), was applied to flax as a pre-planting treatment at 10 lb active ingredient/A. Two formulations, a granular and a liquid, were compared. Each was applied and incorporated into the soil by working with the discer twice. Flax was sown immediately after application. The test was not replicated but an untreated check plot was left beside each treated plot. The plot sizes were 26 x 100 ft for the liquid and 15 x 15 ft for the granular material. Results - The granular form was much less harmful to the flax than the liquid. Where

the liquid was applied the stand two weeks after seeding was 5%, while the granular material reduced the stand to 50%. Most of the flax was killed before emergence, but some was killed after. The yield from the granular treated plot was 7.3 bu/A compared with 9.7 bu for the check plot. The liquid application resulted in a crop failure. There was only a light intestation of wild oats on the field this year, and the intestation was not uniform, so the differences in wild oat intestation cannot be considered as significant. However, no wild oats grew on the treated plots, while the check plot contained 0.16 wild oat plants per square yard. (Contributed by the Experimental Farm, Regina, Sask.). Approved for publication.

Rates for applying 1,2,4,5-tetrachlorobenzine for wild oats. Molberg, E. S. and Leggett, H. W. 1,2,4,5-tetrachlorobenzine was applied on June 26, 1957 to land being summerfallowed and which had a natural intestation of wild oats. It was applied in a dry form containing 50% active ingredient. Immediately after applying, the chemical was incorporated into the soil by oneway discing twice. The rates of application were 5, 10, 12.5 and 15 lb/A of active ingredient. The design was a 5 x 5 latin square. Results: The number of wild oat plants per square yard which reached heading stage during the season following these treatments, were as follows: Check (no chemical) 0.31, 5 lb 0.18, 10 lb 0.00, 12.5 lb 0.01, 15 lb 0.01. The 10 lb rate gave 100% control and the 5 lb rate gave 42% control. (Contributed by the Experimental Farm Regina, Sask.). Approved for publication.

Methods of incorporating 1,2,4,5-tetrachlorobenzine into the soil for wild oat control. Molberg, E. S. and Leggett, H. W. 1,2,4,5-tetrachlorobenzine was applied on June 26, 1957 to land being summerfallowed, and which had a natural infestation of wild oats. It was applied in a dry form containing 50% active ingredient, and at 15 lb active material/A. The chemical was incorporated into the soil by 3 tillage methods, with 3 degrees of packing with each incorporation method. The treatments were made in duplicate with a check plot adjacent to each treated plot. Results - The oneway disc gave better results than the rototiller. Oneway discing twice was more effective than oneway discing once. Packing after incorporation decreased the effectiveness of the chemical. The control of wild oats ranged from 87.5 to 100%. (Contributed by the Experimental Farm, Regina, Sask.) Approved for publication.

Spring vs. fall applications of 1,2,4,5-tetrachlorobenzine. Molberg, E. S. and Leggett, H. W. A material containing 50% 1,2,4,5-tetrachlorobenzine was applied and incorporated into summerfallowed land on October 15, 1956 and on May 6, 1957 for the control of wild oats. The rates of application were 7.5, 10 and 15 lb active ingredient/A. Duplicate strips were rod-weeded and sown to wheat, oats, barley and flax on May 17. Two strips were rod-weeded at the time of seeding but left unseeded. Three strips were left without tillage or seeding after the chemical was incorporated into the soil. Results: The fall application was the best from the standpoint of wild oat control and yield of crops. The 10 lb rate gave best wild oat control with the fall application, and the 15 lb rate with the spring application. Yields decreased as the rate of application increased. All crops were damaged to some extent by the chemical. Flax was the only crop that showed a marked degree of tolerance. The average reductions of wild oats in the four crops resulting from the fall and spring applications at the 7.5, 10 and 15 lb rates were 43.8%; 75.7% and 79.2% respectively. These rates reduced the yields of wheat, oats, and barley by 39.4%; 63.2%,aand 77.0%. Flax yields were decreased by the fall applications and increased by the spring treatments. On the average the 7.5 and 10 lb rates increased flax yields by 27.0 and 29.4% respectively, while the 15 lb rate decreased the yields by 16.2%. The rod weeding done at seeding time killed considerable numbers of wild oats which were growing on plots which had received no chemical. (Contributed by the Experimental Farm, Regina, Sask.). Approved for publication.

Effect of cultural treatments for controlling wild oats. Molberg, E. S. and Leggett, H. W. Selkirk wheat and Olli barley were sown at heavy and light rates, with and without fertilizer, and at two dates on land having a heavy infestation of wild oats. The wheat was sown at 2 1/2 and 1 1/4 bu/A, and the barley at 3 and 1 1/2 bu/A. The fertilizer treatment was 50 lb 11-48-0/A. The test was conducted for the 5 year period 1953-1957. Results: The average number of wild oat plants per square yard and yields of crops resulting from the different cultural practices for the 5 year period were as follows.

Treatment	Wheat		Barley	
	Wild oats sq yd	Yield bu/A	Wild oats sq yd	Yield bu/A
Early seeding	130.7	13.2	53.9	27.8
Late seeding	34.7	9.2	21.0	15.4
50 lb 11-48-0	68.5	11.5	37.2	22.1
No fertilizer	96.9	10.9	37.8	21.0
Heavy seeding	90.0	12.5	38.4	22.4
Light seeding	77.6	9.9	36.5	20.8
Average, all treatments	82.7	11.2	37.5	21.6

Growing barley instead of wheat and delayed seeding were the most effective methods of control. Delayed seeding resulted in yield reductions. No method was entirely satisfactory every year. In three of the 5 years delayed seeding reduced the wild oats to about 1 or less plants per square yard. (Contributed by the Experimental Farm, Regina, Sask.). Approved for publication.

Relation of time of cultivating stubble land after harvest to the germinability of wild oats. Molberg, E. S. and Leggett, H. W. A field with a heavy infestation of wild oats was disced at different dates from immediately after harvest until seeding time the following spring, when it was sown to barley. Wild oat seeds were collected from the surface of the field before each tillage operation and tested for germination. The wild oat infestation in the crop and yields of barley were determined. Discing was done on 4 dates in 1956, and on 6 dates in 1957 as shown in the table.

Date of tillage	% Germinability of wild oats		Wild oat plants /sq yd		Yield in bu clean barley	
	1956	1957	1956	1957	1956	1957
After harvest (Aug 29)	-	6.2	-	34	-	10.4
Sept. 20	12.7	6.5	317	38	7.8	9.5
Oct. 5	12.6	2.4	182	38	13.3	8.6
Oct. 25	1.9	4.2	362	22	13.8	9.6
Early spring (Apr. 30)	-	1.0	-	27	-	8.4
Seeding time (May 9)	7.6	0.5	205	26	13.8	11.8

In the germinator the wild oats germinated best in the early fall, but due to dry soil conditions they did not germinate immediately after discing in the field. Late fall or spring tillage resulted in cleaner crops than the early fall tillage treatments in 1957, but this trend was not evident in 1956. No benefit was obtained from early spring tillage in 1957. (Contributed by the Experimental Farm, Regina, Sask.). Approved for publication.

The effect of several chemicals applied to weeds on irrigation laterals. Nash, Russel L. Duplicate square-rod plots were treated at two locations on April 25 and 26, 1957. The entire ditch and several feet beyond the shoulders was treated. Kochia, pigweed, foxtails and wild barley, as well as some cultivated bromegrass, were the common weeds at North Platte. At Elwood, the predominant species of weeds were downy brome, wild rye, and Mexican dropseed. Chemicals applied were the sodium salt of 2,3,6-trichlorobenzoic acid at 15, 40 and 60 lb/A; neburon, monuron and diuron at 12 and 15 lb/A; erbon at 80 and 160 lb/A; Simazin at 6 and 10 lb/A; TBA at 15 lb plus monuron at 2 lb/A; and amizol at 1 lb plus monuron at 2 lb/A. all on the active basis. Ammate at 160 and 320 lb/A and Ureabor and Chlorea at 320 and 640 lb/A were applied as actual commodity.

All chemicals except neburon and ammate were effective on annual weeds for about 6 weeks. At the time of the first irrigation, around July 6, Ureabor, Chlorea, diuron, monuron, and Simazin were still controlling all weeds at both rates at both locations. Erbon was still controlling the weeds at Elwood. The other plots at this time were becoming quite weedy.

Final notes on September 10, after the last irrigation, showed Ureabor, Chlorea, monuron and Simazin to be still effective at the North Platte test. At Elwood, Ureabor, erbon, monuron, and diuron still looked very good with Chlorea and Simazin a little less effective.

Results of these tests indicate Ureabor, Chlorea, erbon, monuron, diuron and Simazin can be used effectively for controlling weeds on an irrigation lateral. (Contributed by University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.). Approval for publication not required.

The effect of post-emergence application of four herbicides to wild oats, 1957. Selleck, G. W. and Alex, J. F. Dalapon, TCA, ATA and TBA at initial rates of 40 lb/A active ingredient, were applied June 17 and July 8 to wild oats in the 4-leaf and early heading stages, respectively. The logarithmic sprayer delivered 102 gal/A and decreased the concentration of herbicide one-half every 21 ft. Results: At a rate of 34 lb/A TBA killed the wild oats completely. The 15 lb rate killed 70% of the wild oats, the surviving inflorescences being sterile. ATA at 24 lb/A rendered the wild oats sterile and the leaves were chlorotic at a rate of 3 lb/A. Dalapon at 16 lb/A rendered the wild oats sterile and heading was delayed at a rate of 3.6 lb/A. TCA at 40 lb/A had little effect on the wild oats. Results were less effective at the later date of application. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of pre-emergence applications of CDAA and Tetrachlorobenzene on wild oats. Selleck, G. W. and Alex, J. F. CDAA granular and spray at rates of 2, 3 and 4 lb/A and 1,2,4,5-tetrachlorobenzene at 5, 7.5 and 10 lb/A active ingredient were applied to wild oat infested plots on loam soil near Spalding, Sask. on May 25, 1957. The CDAA granular was applied with a C.M.S. fertilizer attachment, the spray with a farm sprayer delivering 7 gal of water/A, and the tetrachlorobenzene with a 4-ft Gandy spreader. The smallest plot was 0.75 acres in size. One-half of each plot of CDAA granular was not incorporated into the soil; the other half was harrowed. One-half of each plot of CDAA spray and tetrachlorobenzene was one-wayed once, and the other half one-wayed twice for incorporation into the soil. The plots were seeded to barley 3 days later. Results: The number of wild oat plants was counted in five 0.5 sq m quadrats in each treated plot and adjacent check plot to determine percentage control. The population of wild oats and per-

centage control based on quadrat counts are summarized in the table.

Herbicide	Rate lb/A	Incorporation into soil	Mean no of wild oats/0.5 sq m Treatment	Check	Percentage control
CDAA granular	4	harrow	8.8	29.6	70.5
" "	4	nil	27.6	152.6	82.4
" "	3	harrow	36.2	79.4	54.4
" "	3	nil	289.2	349.8	17.4
" "	2	harrow	48.8	79.2	38.4
" "	2	nil	149.6	333.4	55.2
CDAA spray	4	one-way once	104.0	200.8	47.6
" "	4	one-way twice	104.0	213.8	40.8
1,2,4,5-tetrachloro-benzene	10	one-way once	93.8	35.2	-
" "	10	one-way twice	126.6	243.6	48.2

A good response was obtained with the 4 lb/A rate of CDAA granular. However, heavy populations of wild oats were still present in potholes. Although no reduction of the wild oat population was visible in plots treated with tetrachlorobenzene, a 50% reduction was obtained in two quadrats where the wild oat population exceeded 1000/sq m. None of the treatments appeared to damage or delay the barley. Good control of wild oats was obtained without damage to the barley in plots sprayed with CDAA where the sprayer had stopped and delivered more than 4 lb/A.

A similar experiment was conducted on clay soil near Saskatoon. The wild oat infestation was not uniform, necessitating quadrat counts only in potholes where wild oats were present. Where granular CDAA was applied at 3 lb and 4 lb/A wild oats were controlled by a mean of 50% as determined by quadrat counts. These decreases in the wild oat population were scarcely discernible by the visual estimation method. Little reduction of the wild oat population was obtained on any of the other treatments. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of pre-planting treatments of three herbicides on three annual weeds, 1957. Selleck, G. W. and Alex, J. F. On May 9, 1957, pre-planting treatments of CDT and IPC at initial rates of 24 lb/A and DCU at 64 lb/A active ingredient were applied to annual weeds on duplicated plots 15 x 136 ft. The herbicides were applied with a logarithmic sprayer which delivered 34 gal/A. The concentration of herbicide decreased continuously along the length of the plot so that the amount applied was halved every 21 ft. The herbicides were incorporated into the soil with a double disk. Seed of wild oats, green foxtail and red-root pigweed was planted after 5 days. Results: The rates of three herbicides in lb/A required to provide various degrees of control of these weed species (based on visual estimates) are provided in the following table.

Herbicide	Weed species	Percentage control 100	90	80	70	50
DCU	Wild oats	54	25	-	-	20
	Green foxtail	12	-	7	-	5
	Red-root pigweed	-	64	55	-	-
IPC	Wild oats	4.5	3.5	2.5	-	1.7
	Green foxtail	-	-	-	10.5	8.5
CDT	Wild oats	22	13	-	7	4.5
	Green foxtail	-	18	15	-	11
	Red-root pigweed	-	-	-	21	-

DCU depressed the growth of wild oats and green foxtail at a rate of 2.5 lb/A. CDT depressed the growth of wild oats at 2.5 lb/A and green foxtail at 9 lb/A. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of pre-planting treatments of certain herbicides on annual weeds, 1957. Selleck, G. W. and Alex, J. F. Pre-planting treatments of 3,4-DMP and CDAA were applied to annual weeds May 7, 1957 on duplicated 15 x 136 ft plots with a logarithmic sprayer at initial rates of 16 lb/A active ingredient. The concentration of herbicide decreased continuously along the length of the plot so the amount applied was halved every 21 ft. CDAA granular at 2,4 and 8 lb/A, 2,4-DEB at 1.25, 2.5 and 5 lb/A, 1,2,4,5-tetrachlorobenzene at 2.5, 5 and 10 lb/A and CIPC-IPC combination at 2.5, 5 and 10 lb/A active ingredient were applied in granular form with a 4 ft Gandy spreader to plots 12 x 45 ft. The herbicides were incorporated into the soil with a double disk and the weeds sown 5 days later. Results: Percentage control is based on visual estimates. The 8 lb/A rate of CDAA granular provided 60% control of wild oats, but no effects were visible at lighter rates. The CDAA spray provided 90% control of wild oats at a rate of 11.5 lb/A and 60% control at a rate of 2.5 lb/A. Top growth was depressed at a rate of 1.4 lb/A. The 12 lb/A rate controlled red-root pigweed and green foxtail by 60% and 30% respectively and the 6 lb rate depressed the growth of green foxtail. The three rates of 1,2,4,5-tetrachlorobenzene each provided 70% control of wild oats. The two heavier rates of 2,4-DEB and CIPC-IPC combination depressed the growth of wild oats, and the heaviest rate of 2,4-DEB delayed green foxtail. 3,4-DMP appeared to have little effect on any of the weeds tested. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Pre-seeding chemical treatments for wild oat control in sugar beets. Sexsmith, J. J. Quadruplicate plots were established on a silty clay loam irrigated soil having a light infestation of wild oats, after a further supply of wild oat seed has been broadcast and the area harrowed. The following treatments were applied and the area was thoroughly disked in two directions on May 2, 1957: IPC and CDAA at 4, 6, and 8 lb/A, and TCA at 5, 10, and 15 lb/A, all at a solution rate of 20.1 gal/A; and DCU at 5, 10, and 15 lb/A applied in approximately 310 gal/A. Beets were seeded on May 3, and estimates of wild oat control and notes on crop condition were taken on June 10. Harvest results are not available. Results: The following estimates of wild oat control were obtained: 91%, 97%, and 96% for IPC, and 70%, 85%, and 93% for CDAA, at 4, 6, and 8 lb/A; 55%, 78%, and 85% for TCA, and 25%, 50%, and 56% for DCU, at 5, 10, and 15 lb/A. Wild oat control resulting from IPC was slightly better, and from CDAA and DCU was considerably better, than had been obtained in previous seasons, probably as a result of the better soil moisture conditions that prevailed at seeding time in 1957. This was the first year that TCA had been tested as a pre-seeding treatment, and wild oat control was much greater than from the previously-tested pre-emergence applications. The only material causing visible injury to beets was CDAA. All rates of CDAA had affected germination of the beet seed, the 8 lb/A rate having caused a serious delay of up to 50% of the beet stand existing on June 10. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.) Approved for publication.

Effect of pre-seeding application of chemicals for wild oat control in several "specialty" crops. Sexsmith, J. J. Duplicate plot areas, previously broadcast-seeded with wild oats, were treated with numerous herbicides on May 15, 1957, immediately disked in two directions, and seeded with 8-ft rows of the following crops on May 16: potatoes, cucumbers, carrots, table beets, sugar beets, processing peas, green beans, and dry beans. The following chemicals were included: IPC, CIPC, CDAA, CDEC, and ethyl N,N-di-n-propylthiolcarbamate (EPTC), at rates of 4 and 6 lb/A; and

DCU and 1,2,4,5-tetrachlorobenzene (M-757) at 7 1/2 and 15 lb/A. The M-757 was applied in dry form, DCU was applied at a solution rate of approximately 195 gal/A, and all other materials were applied at a solution rate of 20.1 gal/A. Weed control and crop injury ratings were taken on August 12. Results: Wild oat control was estimated to be 68% and 75% for IPC, 78% and 80% for CIPC, 20% and 60% for CDAA, 65% and 68% for CDEC, and 88% and 98% for EPTC, at the 4 and 6 lb rates, respectively; 25% and 35% for DCU and 35% and 87% for M-757 at 7 1/2 and 15 lb/A. Considering only those treatments giving better than 80% wild oat control, the crop reactions were as follows: EPTC caused severe injury to cucumbers and carrots, and slight injury to peas; M-757 completely killed carrots, caused moderate injury to both types of beets, and slight injury to peas; CIPC did not injure potatoes or peas, caused moderate injury to cucumbers, but only slight injury to the other 5 crops. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.) Approved for publication.

Effect of pre-seeding application of chemicals for green foxtail (Setaria viridis) control in several "specialty" crops. Sexsmith, J. J. Duplicate plot areas, previously broadcast-seeded with green foxtail, were treated with numerous herbicides on May 15, 1957, immediately disked in two directions, and seeded with 8-ft rows of the following crops on May 16: potatoes, cucumbers, carrots, table beets, sugar beets, processing peas, green beans, and dry beans. The following chemicals were included: IPC, CIPC, CDAA, CDEC, and ethyl N,N-di-n-propylthiolcarbamate (EPTC), at rates of 4 and 6 lb/A; and DCU and 1,2,4,5-tetrachlorobenzene (M-757) at 7 1/2 and 15 lb/A. The M-757 was applied in dry form, DCU was applied at a solution rate of approximately 195 gal/A, and all other materials were applied at a solution rate of 20.1 gal/A. Weed control and crop injury ratings were taken on August 12. Results: Green foxtail control was estimated to be 20% and 30% for CIPC, 25% and 40% for CDAA, and 83% and 95% for EPTC, at the 4 and 6 lb rates, respectively; 50% and 60% for DCU at 7 1/2 and 15 lb/A; and 0% for both rates of IPC, CDEC, and M-757. Of all chemicals included, EPTC was the only one giving over 80% control of the green foxtail, this being accomplished with severe injury to cucumbers and carrots, slight injury to peas, but with no injury to the other 5 crops. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.) Approved for publication.

Pre-seeding chemical treatments for green foxtail (Setaria viridis) control in sugar beets. Sexsmith, J. J. Quadruplicate plots were established on a silty clay loam irrigated soil having a light infestation of green foxtail, after a further supply of foxtail seed had been broadcast and the area harrowed. The following treatments were applied and the area was thoroughly disked in 2 directions on May 2, 1957: IPC and CDAA at 4, 6 and 8 lb/A, and TCA at 5, 10, and 15 lb/A, all at a solution rate of 20.1 gal/A; and DCU at 5, 10, and 15 lb/A applied in approximately 310 gal/A. Beets were seeded on May 3, and estimates of green foxtail control and notes on crop condition were taken on June 10. Harvest results are not available. Results: The following estimates of green foxtail control were obtained: 0%, 0%, and 45% for IPC, and 37%, 64%, and 77% for CDAA, at 4, 6, and 8 lb/A; 75%, 84%, and 91% for TCA, and 25%, 42%, and 77% for DCU, at 5, 10, and 15 lb/A. Although IPC at 4 and 6 lb/A gave no control of green foxtail, all the plants were somewhat delayed. On June 25 a fair number of foxtail seedlings were seen on the CDAA plots, and it would seem that the chemical had delayed germination and, therefore, the control ratings given above could be considered as being slightly high. The only material causing visible injury to beets was CDAA. All rates of CDAA had affected germination of the beet seed, the 8 lb/A rate having caused a serious delay of up to 50% of the beet stand existing on June 10. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.) Approved for publication.

Effect of fertilizers on wild oat infestation in stubbled-in spring wheat. Sexsmith, J. J. and Russell, G. C. Eight-row, rod-length plots of Chinook spring wheat were seeded on burned-over stubble land heavily infested with wild oats at Stavely, Alberta, on May 10, 1957. Six-replicated treatments with fertilizer were made at time of seeding using 0, 20, and 40 pounds of nitrogen (from ammonium nitrate and phosphorus (as P_2O_5) in all possible combinations. The wild oat infestation, though somewhat variable, was too dense to make weed counts of any practical value. At harvest time all growth on 3 square yards of each plot was cut at ground level and an estimate made of wild oat shattering. A separation was made of the crop and wild oat seeds of the threshed samples. Results: Fertilizer treatments that gave significant crop response also caused wild oats to grow better and produce a greater quantity of seed. In general, the best fertilizer treatment for the spring wheat caused the wild oats to be 50% taller, produce 50-60% more seed, and by harvest time shatter 10-20% more seed than the wild oats in the unfertilized plots. Total straw production (wheat and wild oats) was 2 1/2 times greater as a result of the best fertilizer treatment included in the test. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.) Approved for publication.

Effect of all chemical treatment and previous tillage on control of downy brome and volunteer wheat. Shafer, N. E. The following chemical treatments were applied by airplane: 2 lb M-177 in 2 gal oil/A; 2 lb M-103-A in 2 gal oil/A; M-177 and M-103-A each at 2, 4, and 8 lb/A in 5 gal oil/A; and Karmex W at 2 and 4 lb/A in 5 gal water per acre. All chemicals were applied across the following previous tillage treatments: untilled, one-way disc, Miller rod weeder, chisel, Dempster 30" sweeps, and Noble blade. Land tillage was done in August following wheat harvest and chemicals were applied September 6. Percentage weed kill was estimated April 26, 1957. Results: The following are averages of percentage kill obtained across all 6 tillage treatments. 2 lb M-177 in 2 gal oil, 29%; 2 lb M-103-A in 2 gal oil, 40%; 2 lb M-177 in 5 gal oil, 56%; 2 lb M-103-A in 5 gal oil, 60%; 4 lb M-177 in 5 gal oil,59%; 4 lb M-103-A in 5 gal oil, 68%; 8 lb M-177 in 5 gal oil, 74%; 8 lb M-103-A in 5 gal oil, 71%; 2 lb Karmex W in 5 gal water, 87%; and 4 lb Karmex W in 5 gal water, 96%. August tillage greatly increased the germination of downy brome and volunteer wheat. (Contribution Agronomy Department, University of Nebraska, Lincoln, Nebraska.)

A comparison of dalapon formulations in low volume airplane application for control of downy brome. Shafer, N. E. One acre blocks of wheat stubble heavily infested with downy brome were treated by airplane April 26, using 2 gal/A as the total volume applied. Dalapon formulations and rates were as follows: an ester formulation, an amine salt, and the sodium salt were each used at 3 and 6 lb/A. Soil moisture conditions were excellent. Downy brome was small, mostly with only 2 to 4 leaves. It appeared that most of the infestation resulted from spring germination rather than the usual fall germination. Some areas were covered with a heavy residue of weed growth from the previous year which gave considerable protection to some of the downy brome. All treatments were applied on 1/2" of melting snow as the result of a light snowfall the night before. Temperature was rising rapidly under full sunshine the morning of treatment. Results: Percentage kill one month after treatment; dalapon ester 3 and 6 lb/A, 90 and 95% respectively; dalapon amine salt 3 and 6 lb/A, 50 and 70%; dalapon sodium salt 3 and 6 lb/A, 50 and 85%. Most of the surviving plants in the ester plots were under heavy debris. At the low volume used the ester appeared more than twice as effective as the amine or sodium salts for control of downy brome. (Contribution Agronomy Department, University of Nebraska, Lincoln, Nebraska.)

Wild oat control in barley and peas. Soine, O. C., Jordan, L. S., and Dunham, R. S. CDAA at 6 lb; simazin at 6 lb; and EPTC at 10 lb/A were applied to

plowed ground and disked in before sowing barley and peas and also applied pre-emergence. 3,4-DMB at 12 lb/A was also applied pre-emergence.

Results: Simazin killed both wild oats and crops. Peas showed some tolerance to the pre-emergence application. EPTC pre-planting gave good control of wild oats, killed the barley, and did not injure peas. Pre-emergence, it gave fair control of wild oats, slightly stunted barley, and did not injure peas. 3,4-DMB did not control wild oats, thinned the barley, and did not injure the peas. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3844.Sci. Jour. Series, Minn. Agric. Exp. Station.)

Wild oat control in flax. Soine, O. C. and Dunham, R. S. Dow M-757 (1,2,4, 5-tetrachlorobenzene) was disked in at 20 or 30 lb/A 3 weeks before or one week before sowing flax. It was effective on wild oats and ineffective on Setaria spp. at both rates and dates. One week before sowing was better for wild oat control than three weeks. Flax yields were reduced but were not significantly less than the check

CDAA at 4 or 6 lb/A applied just before seed bed preparation or pre-emergence gave fair control of wild oats, good control of foxtail, and increased yield of flax although it was not significantly better. Simazin at 3, 6, or 15 lb/A pre-emergence gave excellent control of wild oats and killed flax. 3,4-DMB at 12 lb/A did not control wild oats or foxtail. EPTC at 5, 10, or 15 lb/A pre-emergence or post-emergence gave good control of wild oats at 15 lb and foxtail at all rates except 5 lb post-emergence without injury to flax. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3845. Sci. Jour. Series, Minn. Agric. Exp. Station.)

The toxicity of various herbicides to sorghum. Wiese, A. F. and Rea, H. E. In an effort to determine methods of controlling volunteer sorghum in a chemical fallow program, treatments were made to 6 inch sorghum in a triplicated randomized block design. Sodium salt of 2,2-dichloropropionic acid (dalapon), 3-amino-1,2,4-triazole (ATA), Diethanol-amine salt of maleic hydrazide (MH) and Polychlorobenzoic acid (13.3% dichloro, 31.6% trichloro, 51.7% tetrachloro and 3.4% pentachloro) were applied at 6, 6, 6, and 8 lb/A, respectively, in various carriers. Various combinations of dalapon and ATA were also applied in water. The effectiveness of the treatments was evaluated by determining the percent of sorghum plants killed 2 months after the date of chemical application.

Results: The best kill was obtained with MH applied in 40 gal of water/A. The addition of 1/2 % wetting agent to the water carrier significantly reduced the kill with MH from 97 to 75%. Dalapon applied in either 40 gal of water/A, 40 gal of water/A plus 1/2 % wetting agent, or 30 gal of water emulsified with 10 gal of diesel oil/A gave 14, 44, and 57% kill, respectively. ATA in 40 gal of water or 40 gal of water plus 1/2 % wetting agent/A gave 27 and 21% kill, respectively. Polychlorobenzoic acid was not toxic to the sorghum. Combinations of dalapon and ATA applied at either 6 and 1 or 6 and 2 lb/A, respectively, did not affect the toxicity of the dalapon. The least significant difference at the 0.05 level in this study was 15%. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.) Approved as TAES T. A. 2783

Use of chemicals for weed control in fallow. Wiese, A. F. In an effort to find chemicals that would control weeds during a fallow period, several herbicides were tested on a wheat stubble field containing Russian Thistle (Salsola pestifer), kochia (Kochia scoparia), puncture vine (Tribulus terrestris), stink grass (Era-

Agrostis cilianensis) and witch grass (Panicum capillare). The herbicide treatments were applied on June 12, 1956, in a triplicated randomized block design and the data were taken August 7, 1956. The rainfall for the experimental period was 4.39 in.

Results: None of the chemicals controlled the weeds as well as did tillage. The most effective chemical weed control was obtained with one pound of propylene glycol butyl ether ester of 2,4-D plus 5 or 10 pounds of sodium salt of 2,2-dichloropropionic acid (dalapon) per acre, or from (ethanol and isopropyl) amine of 2,4-D applied at 3 or 6 lb/A immediately after a mechanical tillage operation. Three-amino-1,2,4-triazole (ATA) applied at 2, 4 or 6 lb/A gave grass weed control equivalent to that obtained with dalapon, but did not satisfactorily control the broadleaf weeds. Three-(phenyl)-1, 1-dimethylurea (fenuron) applied at 2 or 4 lb/A did not control grass or broadleaf weeds during the experimental period. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.) Approved as TAES T. A. 2785.

Pre-emergence application of ethyl N, N-di-n-propylthiolcarbamate (EPTC) at Halstad, Minnesota to control Setaria and wild oats in corn, flax, wheat and barley. Zinter, C. C. Amstrup, C. R. and Slough, A. T. Applications of 4 and 2 lb active ingredient in 10 gal of water/A were made in triplicate on seeding date, May 24, 1957. There was no noticeable crop injury or weed control. June and July rainfall was excessive. Wild oat population was lower than desirable. No yield tests taken. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.) Approval not required.

Pre-emergence application in 1955, 1956 and 1957 of 2-chloro-N,N-diallylacetamide (Randox) at Halstad, Minnesota to control Setaria and wild oats in small grain, corn, soybeans and flax. Zinter, C. C. Amstrup, C. R. and Slough, A. T. Triplicate applications of 6 and 3 lb active ingredient in 1955 and 4 and 2 lb active ingredient in 1956 and 1957. Water was used to apply 10 gal of solution/A. 1955 applications were made April 29 (2 days after seeding); soil was dry and remained dry for 3 weeks; from then till heading, moisture was excessive. Weather was cool during the first 3 weeks. Visual comparisons indicated little, if any, control of wild oats or Setaria or any crop injury at either rate of application.

Triplicate applications were made May 29, 1956 (day after seeding) and May 24, 1957 (seeding date). Moisture was plentiful to excessive at time of application and remained so during most of growing season. Visual observations in 1956 and 1957 indicated good Setaria and wild oat control for 6-8 weeks with both 4 and 2 lb rates. Rough pigweed and mustard were controlled for 4-6 weeks. Crops were not injured at either 4 or 2 lb rates. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.) Approval not required.

Annual, Winter Annual, and Biennial Broad-leaved Weeds

Summary

Thor Kommedahl

Thirteen of the 20 abstracts contain reports of work with wild buckwheat and the work was done at either Manitoba or Saskatchewan. Forsberg found neburon to be 100 per cent effective on wild buckwheat in pure stands (at rates above 1 lb/A) and in oats, wheat and crested wheat. McCurdy reports some yield reduction of wheat from neburon at 4 lb/A; however Forsberg found that at 4 or 6 lb/A, no yield losses occurred for either wheat or oats, and wild buckwheat was controlled in both crops. The addition of 2,4 DE and LV-4 to neburon controlled not only buckwheat but lambs quarters and Russian thistle as well.

Acting more slowly than neburon on wild buckwheat, the isopropylamine salt of 2,4-D gave 100 per cent control when applied early with 2 applications. Also eminently effective without injury to wheat or oats, was 2,4-DE with 2 early applications. Selleck also reports the butyl ester of 2,4-D to be effective. However Brown did not get as effective control of wild buckwheat in flax or wheat using the ester of 2,4-D. With 2,3,6-TBA, Selleck controlled wild buckwheat 100 per cent.

Friesen found neburon to be effective in controlling tartary buckwheat in barley or oats with no injury to the latter. Neburon however was ineffective in pre-emergence applications. The addition of 2,4-D and LV-4 to neburon hastened kill of tartary buckwheat but did not alter the final result. Vanden Bern reports also that neburon is more effective than the esters of 2,4-D. Pre-emergence applications with simizim gave 100 per cent control of tartary buckwheat.

When the population of tartary buckwheat in barley was 25 or 50 plants/ sq yd, no increase in yield was found upon spraying plants with 2,4-D; however at 100 plants/sq yd the application of 2,4-D resulted in higher barley yields, according to Vanden Born and Corns.

Russian thistle was controlled by an ester of 2,4-D, by 2,3,6-TBA, by the amine of 2,4-D, and by 3 treatments of ATA, in work by Selleck. Also, Sexsmith reports excellent control with both the ester and amine of 2,4-D and with 4(2,4-DB); however at the rates necessary for control, there was moderate injury to crops.

The ester of 2,4-D at 1 lb/A proved to be the most effective chemical in reducing stands of nodding thistle; however it was necessary to retreat 1 year later, according to Freeman.

Selleck reports results on a number of weeds: purslane and stinkweed were controlled with 2,3,6-TBA or with the butyl ester of 2,4-D; red-root pigweed was controlled satisfactorily with CDT, and better yet with DCU or 2,3,6-TBA; lambsquarters was satisfactorily controlled with the amine of 2,4-D, but better control was obtained with the butyl ester of 2,4-D; for common wild mustard, good control was achieved with ATA at 5 oz/A, and complete control with the butyl ester of 2,4-D; green smartweed was controlled 80 per cent with the isopropylamine salt of 2,4-D; flixweed was controlled satisfactorily with ATA and completely, with the butyl ester of 2,4-D at 8 oz/A; and hemp nettle was controlled satisfactorily with the butyl esters of MCPA, MCPB, 2,4-DB, the sodium salt of 2,4-DB, and the isopropylamine salt of 2,4-D. Vanden Born and Corns also report control of hemp nettle, in oats, using the esters of MCP and MCPB.

Selleck in Canada reports experiments in substituting herbicidal applications for cultivations where 3 cultivations were required to effect control of a number of annual weeds. In general he could substitute 1 cultivation for 1 herbicidal application with essentially the same results. Phillips in Kansas reports comparisons of cultivation, chemicals and combinations of the two as methods of maintaining summer fallow and weed control.

Abstracts

Herbicides for control of wild buckwheat in crops of wheat and flax. Brown, D. A. 2,4-D ester; 2,4-D low volume butyl ethel ester and MCPA ester were applied at rates of 5 and 8 oz/A. active acid in single, double and triple doses beginning when buckwheat plants were in the one to two true-leaf stage. Double and triple doses were applied at weekly intervals. Results: Wheat Crop. Percent control by number of applications all chemicals one dose 31, two 40, three 60%. Average percent control by rates, all chemicals 5 oz., 47%; 8 oz., 54%. Average control each chemcial, 2,4-D ester 51%; 2,4-D lV. 10-10, 49%; MCPA ester 42%. Wheat was heavy and provided strong competition to the weed. Heavy rains after wheat was cut induced regrowth of buckwheat. Cleanliness of the thrice sprayed plots showed to advantage in the stubble. Flax crop. Lack of competition by flax more clearly defined the treatments than in the wheat crop. Percent control of buckwheat by times of application; once 30; twice 55 and three times 74%. Average percent control all chemicals 5 oz., 48%; 8 oz., 58%. Average control each chemical 2,4-D butyl ester 67%; 2,4-D lV. butyl ethel ester 64%; MCPA ester 27%. Grain yields. Wheat. Average of all chemicals and rates once sprayed 32.5 bu.; twice 30.9 bu.; and sprayed three times 29.1. Untreated check 34.7 bu. Flax. Average all chemicals and rates, sprayed once, 5.7 bu/A, twice 5.2 and three times 4.4 bu/A. Untreated check 3.3 bu. The 2,4-D formulations severely damaged the flax when sprayed three times. Damage by MCPA was relatively light. "Aster yellows" in flax gave rise to abnormal reaction in this crop, but there was ample evidence that heavy infestations of wild buckwheat in flax cannot be controlled without serious injury to the crop. On the other hand the heavy treatments in this experiment subdued the weed, and, although the crop was severely set back, it outyielded the very weedy check plots. (Contribution from Experimental Farm, Brandon, Man.)

Effect of 2,4-DE, LV-4 and MCPA on wild buckwheat when sprayed at an early stage of grain. Forsberg, D. E. In 1956 and 1957, 2,4-DE, LV-4 and MCPA, in a four replicated test, were sprayed on wild buckwheat in Chinook wheat, at 5, 8, 12 and 16 oz. of acid equivalent/A, and also at two 5 oz. applications sprayed one week apart. The grain was sprayed as it emerged and in the first leaf stage. At this stage the buckwheat was in the cotyledonous leaf stage. Results: The average yields and percentage weed kill are presented in the following table for 1956 and 1957.

	MCP		2,4-DE		LV-4	
Rates	Weed Kill	Yield Bu/A	Weed Kill	Yield Bu/A	Weed Kill	Yield Bu/A
5 oz	84	24.3	91	23.9	94	23.4
8 oz	86	24.7	99	21.7	99	23.1
12 oz	95	22.8	99	21.5	99	20.6
16 oz	94	23.7	99	22.3	95	21.2
5 + 5 oz	93	25.3	100	22.6	100	20.3
Check	00	23.0	00	23.0	00	23.0

An analysis of variance in each year showed no significant difference in yields. As will be noted, good control of buckwheat was obtained with 8, 12, 16 and the double applications of all herbicides used. The highest percentage of buckwheat kill was obtained with the double applications of 2,4-DE and LV-4. To get comparable results with single applications rates as high as 12 and 16 oz acid equivalent/A would have to be used. However, numerous deformities and delayed maturity was noted with such treatments. MCPE when applied in double 5 oz applications gave the highest yield and 95% kill of wild buckwheat. Single applications of 2,4-DE and LV-4 at 5 oz at this early stage gave very good control of wild buckwheat. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

The effect of herbicides on wild buckwheat. Forsberg, D. E. During the summer of 1957, 2,4-DE, LV-4, MCPA, 245T low volatile (Naugatuck) and 2,4-D XLV (2,4-D dipropylene glycol ester, Naugatuck) were sprayed on wild buckwheat in a crop of Fortune oats at 5 oz acid equivalent/A, and also in two applications spaced one week apart at 5 oz acid equivalent/A at each application. Neburon (1-N-butyl-3-(3,4-dichlorophenyl)-1-methylurea) was also applied in this test in 4 and 6 lbs/A. The buckwheat was sprayed when plants varied in stages from 2 leaf to the 10 leaf stage and when the crop of oats was in head. Results: Neburon gave 100% kill of wild buckwheat with both rates used. In an analysis of variance there was no significant difference between treatments. However, the 4 lbs. of neburon yielded 1.4 bus. higher than the check, and the 6 lb. rate yielded 3.0 bus. less than the check. The two applications of 2,4-DE gave 83.4% kill of wild buckwheat and yielded .5 bus. higher than the check. All other treatments in the test had similar effects on wild buckwheat, with 2,45 TLV giving the poorest control and also resulted in the lowest yields in oats. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Effect of herbicides when sprayed at different dates, rates and double applications on wild buckwheat. Forsberg, D. E. The following chemicals were sprayed on wild buckwheat in a stand of Chinook wheat at two dates and at three rates of application, 2,4-DE, LV-4, Diax (isopropylamine salt of 2,4-D), H-1144(No. JT-474-3, Dow Chemical Co.), Neburon (1-N-Butyl-3(3,4-Dichlorophenyl)-1-Methylurea), MCPB butyl ester, 2,4-D XLV (2,d-D dipropylene glycoleester, Naugatuck), MCPAE, 2,4-D butyl ester (Butyl 4(2,4-dichlorophenoxy) butyrate), 2,4-DLV (Naugatuck control No. D2862) and 245 TLV (Naugatuck control No. D.2862). The first spraying was done when buckwheat was in the 2 to 6 leaf stage and grain also in the 2 to 4 leaf stage. The second date was applied when the buckwheat was in the 3 to 5 leaf and grain also in the 3 to 5 leaf stage. The rates used were 5 and 8 oz acid equivalent/A and two 5 oz applications spaced one week apart. The neburon was applied at 4 and 6 lbs/A. Results: Due to the dry spring buckwheat germination was very poor and consequently the infestation was very low. However, counts taken on existing plants showed 100% kill with both rates and dates of neburon and 100% kill with diax at the first date when two 5 oz applications were applied. At the later date and with the double application diax gave 91% kill, but the effect on the plants was much slower than the earlier date. Diax significantly reduced the yield of wheat with the double applications and when higher rates were used at a later date. Neburon significantly reduced yields at the later dates and was not significantly lower at the early dates. Other chemicals that gave very good kills of wild buckwheat with double applications were 2,4-DE, LV-4 and 2,4-DLV. LV-4 and 2,4-DLV significantly reduced the yields of grain at both dates. However, the 2,4-DE, which gave 91% kill at the early date, had no effect on the yield of wheat, being identical to the check. All other chemicals gave fair control of wild buckwheat resulting in retardation of growth rather than complete kills. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Effect of herbicides on wild buckwheat. Forsberg, D. E. In 1957, a pure stand of wild buckwheat was sprayed with a number of herbicides at different rates and in double applications. The buckwheat was located in a field which was sown down to crested wheat grass during the early part of June. At the time of spraying the buckwheat varied from the 2nd true leaf to the 6 leaf stage. The following chemicals were used singly at 5 oz acid equivalent/A and also at two 5 oz applications of acid equivalent/A; 2,4-DE, LV-4, MCPAE, Diax (isopropylamine salt of 2,4-D), 2,4-D XLV(2,4-D dipropylene glycol ester, Naugatuck), 245 TLV (Naugatuck control No. D.2862), 2,4-DLV (Naugatuck control No. D.2862), CMPP (a(4 chloro-2 methylphenoxy) propionic acid potassium salt solution), 2,4-D butyl ester, and MCPB butyl ester. Also included in this test was neburon at 4, 6 and 8 lbs./A of active ingredience. Results: One hundred percent kill of buckwheat was obtained with all rates of Neburon. The 4 and 6 lb. rates had no effect on the seedling grass while the 8 lb. rate caused yellowing of leaves. Diax and 2,4-DLV at the double applications also gave 100% kill; however, their effect on the buckwheat was much slower and it required considerable time before such a kill was effected. The double applications of 2,4-DE and LV-4 gave from 70 to 90% kill with the remaining plants setting seed. All single applications, and the remaining double applications, caused a growth retardation and by fall all plants in these plots were setting seed. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Effect of some herbicides on wild buckwheat. Forsberg, D. E. In 1957, a preliminary test was conducted with NPH/46A (a (4-chloro-2-methylphenoxy) propionic acid amine salt solution) and CMPP (a (4-chloro-2-methylphenoxy) propionic acid potassium salt solution) on single plots in a field of Chinook wheat infested with wild buckwheat. Each chemical was applied at 4, 8 and 12 oz of acid equivalent/A. The buckwheat was in the 2 to 8 leaf stage while the grain crop was in the 6 leaf stage. Results: Very little control of wild buckwheat was obtained with either one of these chemicals. Most of the buckwheat plants were retarded slightly, but soon recovered and resumed growth. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Effect of pre-emergence sprays on wild buckwheat. Forsberg, D. E. In the spring of 1957, a four replicated test was laid out and sprayed with herbicides as follows: EPTC (Ethyl, N, N-di-N-propylthiolcarbamate), Vapam (Sodium methyldithiocarbamate) and simazin (2-chloro-4, 6-bis-(ethylamine)-S-triazine) were sprayed on the plots one week before seeding Chinook wheat and worked into the soil by means of a harrow. 2,4-DE and LV-4 were sprayed on the plots immediately after seeding. Vapam and EPTC were applied at 6 and 8 lbs/A while simazin was applied at 2 and 4 lbs/A. The 2,4-DE and LV-4 were applied at 8, 16, 32 and 64 oz of acid equivalent/A. Results: Good control of weeds was obtained with all treatments in the test with the exception of the 8 lb rates of 2,4-DE and LV-4. The EPTC and simazin plots gave better control than the Vapam. However, EPTC significantly reduced the yield of grain on these plots, which resulted in poor samples of grain. Each sample contained a high percentage of immature kernels. Based on results over the past three years it would appear that rates of 2,4-DE and LV-4 should not be lower than one lb of acid equivalent/A to suppress weed growth. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada).

Effect of Neburon (1-N-butyle-3-(3,4-dichlorophenyl)-1-methylurea) on wild buckwheat when sprayed at different rates. Forsberg, D. E. A pure stand of wild buckwheat was sprayed with neburon at 1/2, 1, 2, 3 and 4 lbs. active/A each in 340 gallons of water per acre. The buckwheat was sprayed when in the 2 to 6 leaf stage. Other weeds in the test were, Russian thistle, Russian pigweed and red root pigweed. Results: One hundred percent kill of buckwheat was obtained on the

2, 3 and 4 lb/A rates. While with the 1/2 and 1 lb/A rate plant kills were not complete and were able to produce lateral branches and seed. The other weeds mentioned were resistant to the lower rates and showed some distortion at the higher rates but were not killed. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

The effectiveness of Neburon (1-N-butyl-3-(3,4-dichlorophenyl)-1-methylurea) when used with different volumes of water and in combination with esters of 2,4-D. Forsberg, D. E. Neburon was sprayed on stands of wild buckwheat with a knapsack at 3 and 4 lbs active/A, with the following volumes of water, 100, 170, 230 and 285 gals/A. Also included in this test were 2,4-DE and LV-4 at 5 oz acid equivalent /A in combination with 3 and 4 lbs/A of neburon in 100 gals of water/A. Lamb's quarters and Russian thistle were the other weeds in the test. Buckwheat was sprayed while in the 6 leaf to flowering stage. Results: When neburon was used in combination with 2,4-DE and LV-4, 100% kill of wild buckwheat was obtained as well as 100% kill on lamb's quarters and Russian thistle. All other treatments gave 100% kill of wild buckwheat but resulted in no control of lamb's quarters or Russian thistle. The 100 gals/A of water with both the 3 and 4 lb rate of neburon killed only the top growth of the buckwheat, indicating that there was probably insufficient water used to give good coverage. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Control of nodding thistle in pastures with 2,4-D. Freeman, J. F. Nodding thistle (Carduus nutans L.) is a very troublesome weed in pastures and waste lands in Warren County, Ky. where it is localized. An experiment on a heavily infested Kentucky Bluegrass pasture was laid out April 19, 1956 using a split-plot arrangement replicated 4 times in which the main plots were treatment dates, and sub-plots were herbicides and rates. Treatment dates were (A) at rosette stage 4/18/56 (B) at late bud to early bloom stage 5/28/56 (C) plants 0-8" tall 9/6/56 (D) plants 0-15" tall 10/17/56. The herbicides and rates were 2,4-D as the PGBE ester at 1/4, 1/2 and 1 lb/A; 2,4-D as the amine salt at 3/4, and 1 1/2 lb/A; and no treatments. Plots were 9 x 7 ft in size. The herbicides in water were applied with compression sprayer 1 qt per plot. The number of nodding thistle plants on each plot was determined April 29, 1957. Results: The mean number of nodding thistle plants on the untreated checks was 28. Of the treatment dates there was little difference in effectiveness of A, C or D, where the mean number of plants for all treatments was 7. There was practically no reduction in stand for treatment date B. Of the herbicides, 2,4-D as the ester at 1 lb resulted in greatest stand reduction the mean number for A, C, and D dates being 3.5 plants, while effectiveness of the amine salt at 3/4 lb was slightly poorer, though more effective than the same material at 1 1/2 lb rate or the ester at the 1/2 lb rate. 2,4-D ester at 1/4 lb reduced stands about 50%. Plots of treatment dates A and B were re-treated April 29, 1957 about 1 year after the first application, while those of C and D received no further treatment. The number of thistle plants per plot was again determined June 4, 1957. As a result of the second treatment on plots of A no nodding thistle plants remained even for the 2,4-D ester at 1/4 lb/A and on plots of B the kill was complete for 2,4-D ester at 1 lb, almost complete for 1/2 lb and better than 95% complete on other treatments. The bluegrass and white clover sod showed little or no permanent injury from the use of 2,4-D treatments and most of the broadleaved weeds other than nodding thistle were removed by the treatments. (Agronomy Department, Kentucky Agricultural Experiment Station.)

Tartary buckwheat (Fagopyrum tataricum) control with BDMU (Neburon) 3-(3,4-dichlorophenyl)-1-methyl-1-n-butylurea). Friesen, H. A. Neburon and various other herbicides were applied as pre and post emergent treatments to tartary buckwheat in barley and oats. Post emergence trials: Unfortunately only sufficient neburon was available to test the 2 and 4 lb/A rates in the spring at the time when the buckwheat was in the 2-4 leaf stage and barley in the 4 leaf stage. The

buckwheat infestation on the checks was not heavy (85 plants/sq yd) and growth was suppressed by drouth with dry weight averaging only 214 lb/A. Neburon, at each rate completely killed all but a few plants of buckwheat, not sufficient to permit a measure of dry weight. Yield of barley was not significantly increased at either rate of neburon. In a second trial neburon was applied at ½, 1, 1½, 2, 3, 4 and 6 lb/A to tartary buckwheat in oats seeded late for greenfeed. The ½, 1, 1½ and 2 lb/A rates were also applied mixed with 2,4-D at 5 oz/A, MCP at 5 oz/A was mixed with neburon at 1/2 lb/A as well. The buckwheat had 8 - 10 leaves with some plants showing buds at the time of treatment. Ladys thumb, Polygonum persicaria, was very prevalent on many of these plots. The advanced stage of growth of the buckwheat coupled with the drouth possibly accounted for the very slow and largely incomplete kills with Neburon at rates less than 3 lb/A. The 1½ and 2 lb/A rates resulted in necrotic plants and reduced the dry weight of weeds produced by some 50%, the addition of 2,4-D enhanced the control somewhat. Ladys thumb was not controlled by neburon while the 2,4-D and MCP in the mixtures gave a good measure of control. The 3, 4 and 6 lb/A rates of neburon resulted in 75 to 80% of the buckwheat plants being killed. The oats, except at the 6 lb/A rate, showed no harmful effects but due to the very late seeding, yields could not be obtained. In a third trial neburon was applied at 1, 2, 3 and 4 lb/A to young tartary buckwheat in the 4 - 6 leaf stage on fallow on August 17. The 2, 3 and 4 lb/A rates were each applied in varying volumes of water; viz, 110, 165, 220 and 275 gals per acre. 2,4-D ester and LV-4 at 5 oz/A were mixed with the 2, 3 and 4 lb/A dosages and applied in 110 gals/A of water. Soil moisture was adequate for rapid growth. On August 25th all buckwheat was dead on plots treated with the 2, 3 and 4 lb/A regardless of volume of water used. 2,4-D and LV-4 tended to speed up the kill rather than affect the end result, this effect was most pronounced with the 2 lb/A dosage. The 1 lb/A rate was applied in 220 gals/A of water only and was ineffective.
Pre-emergence trial: Neburon, simazin, EPTC and Randox granular were each applied at 4 lb/A in 100 gal/A of water 2 days after seeding barley. Simazin resulted in nearly 100% kills of buckwheat and ladys thumb. EPTC reduced the number of plants of ladys thumb by some 50% but had little effect on the buckwheat. Randox and neburon were ineffective. Effective rains were not received until three weeks after spraying. (Contributed by the Experimental Farm, Lacombe, Alberta).

The effect of some herbicides on wild buckwheat. McCurdy, E. V. The wheat in this project was sown on stubble in late May but because of lack of precipitation growth of both wild buckwheat and wheat was very retarded. Results are based on the dry weight of wild buckwheat in the plots at harvest time. An amine of MCP at 5 oz/A was applied to one group of plots as soon as the weeds had emerged. This resulted in a reduction of 55 percent. A low volatile ester (Butoxy ethanol) at 5 oz/A applied at the two true leaf stage gave the same degree of control as the MCP applied at the earlier date. A butyl ester, also applied at the two true leaf stage, killed 34 percent of the wild buckwheat. A second application at the same rate applied one week later to some plots resulted in a further reduction of 10 to 15 percent. This reduction was hardly visible in the field. Neburon (1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea) was applied at 1, 2 and 4 lb/A. At the 4 lb/A rate the control was complete; at the 2 lb/A rate 7 percent of the weeds were left and at 1 lb/A 30 percent. In the latter case few of the weeds set seed. A very slight reduction in the yield of wheat was noted in the plots that received 4 lb/A of neburon but at the 1 and 2 lb/A rate the yields were as high as the check. (Contributed by the Experimental Farm, Indian Head, Saskatchewan, Canada).

Annual weed control and soil moisture as affected by methods of summer fallow. Phillips, W. M. Wheat stubble land was cultivated with a large (5 ft) duckfoot-type blade in September 1955. During 1956 cultivation, chemicals, and combinations of the two were compared as methods of maintaining summer fallow. Rainfall during the 1956 summer fallow period was less than 9 inches. Much of the stored soil moisture resulted from heavy precipitation in September 1955. Only three sub-surface tillage operations were required to maintain the cultivation plots in a weed-free condition. Dalapon at 5 lb/A and 2,4-D ester at ½ lb/A, applied as necessary, resulted in satisfactory weed control. Three applications of each chemical were made during the growing season. One spring cultivation followed by chemcial treatment as necessary was less satisfactory than either of the above methods. Treatment with only 2,4-D allowed a heavy growth of weedy grasses to infest the plots. One cultivation followed by pre-emergence applications of 2,4-D or 2,4,5-TP did not give satisfactory weed control. Soil moisture samples were taken at the end of the summer fallow period and the moisture percentages were converted to inches of available water in the upper 6 feet of soil. The greatest amount of moisture, 7.55 inches, was available in the cultivation plots. Other treatments were as follows: dalapon and 2,4-D with no cultivation 6.34 inches, one cultivation followed by dalapon and 2,4-D - 4.82 inches, 2,4-D - 3.16 inches. (Contributed by Crop Research Division, ARS, USDA, and Ft. Hays Branch of Kans. Agr. Expt. Sta., Hays, Kans.)

The effect of pre-planting treatment of 2,3,6-TBA on eight annual weeds, 1957. Selleck, G. W. and Alex, J. F. 2,3,6-TBA was applied May 9, 1957 on duplicated 15 x 136 ft plots and incorporated into the soil with a double disk. The area was sown 5 days later to wild oats, green foxtail, red-root pigweed, lamb's quarters, Russian thistle and wild buckwheat. Certain other weeds emerged which were not sown. The herbicide was applied at an initial rate of 24 lb/A with a logarithmic sprayer which delivered 34 gal/A. The concentration of herbicide decreased continuously along the length of the plot so that the amount applied was halved every 21 ft. A rate of 5 lb/A controlled 99% of annual broad-leaved weeds which were present, while 18 lb/A was required to provide 90% control of annual grasses. The rates in lb/A of 2,3,6-TBA required to provide various degrees of control for certain weed species are provided in the following table.

	Percentage control				
Weed species	100	90	80	70	50
Wild oats	22.0	17.0	10.5	-	5.3
Green foxtail	-	18.0	13.5	-	10.5
Red-root pigweed	-	1.7	-	1.0	0.94
Lamb's quarters	-	1.5	1.0	-	0.8
Russian thistle	3.4	2.0	-	-	0.5
Wild buckwheat	5.8	2.5	-	0.6	0.5
Purslane	15.0	4.8	-	3.0	1.4
Stinkweed	-	5.5	0.5	-	-

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of five herbicides on hemp nettle and green smartweed, 1957. Selleck, G. W. and Alex, J. F. Butyl esters of MCPA, MCPB, 2,4-DB, and the sodium salt of 2,4-DB at initial rates of 4 lb/A active ingredient were applied with a logarithmic sprayer to hemp nettle (Galeopsis tetrahit) and green smartweed

(Polygonum scabrum) on duplicated plots 4.5 x 136 ft. The sprayer delivered 102 gal/A, and the concentration of herbicide decreased continuously along the length of the plot so that the amount applied was halved every 21 ft. Both species had developed one to three pairs of leaves on June 4, the first stage of treatment. Hemp nettle was in the early flowering stage and green smartweed in the late flowering stage on July 8, the second date of treatment. Diax (93% isopropyl amine salt of 2,4-D and 7% isopropyl amine salt of citric acid) at an initial rate of 4 lb/A was applied in the same manner June 17 and July 8. Diax provided 80% control of green smartweed at a rate of 15 oz/A and was more effective at the second stage of treatment. The other herbicides did not control green smartweed. Control of hemp nettle was more effective in the blossom stage than in the three-leaf stage. The rate of application of various herbicides required in oz/A to provide control of hemp nettle is presented in the following table. The data are based on visual estimates where 6 = satisfactory control and 10= complete kill.

Herbicide	Degree of control	
	7	6
4-(2,4-DB) ester	25	14
MCPB ester	32	22
MCPA Na-K salt	24	13
MCPA ester	17	12.5
2,4-DB Na salt	40	--
Diax	--	20

(Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The control of weeds in summerfallow with herbicides, 1957. Sollock, G. W., White, W. J. and Gerrie, J. H. The butyl ester of 2,4-D, and ATA and dalapon at initial rates of 8 lb/A, 20 lb/A and 30 lb/A active ingredients were applied to weeds in summerfallow with a logarithmic sprayer to quadruplicate plots 15 x 136 ft. The sprayer delivered 34 gal/A and the concentration of the herbicide decreased continuously along the length of the plot, so that the rate was halved every 21 ft. Dalapon and 2,4-D were used together for the control of broad-leaved and grassy weeds while ATA was applied alone. The plants to be controlled included wild buckwheat, Russian thistle, stinkweed, lamb's quarters, alfalfa, Russian pigweed, blue bur, common wild mustard, flixweed, wild barley, purslane and volunteer oats. The rate of application of various herbicides required in oz/A to provide various degrees of control to certain weed species are presented in Table 1. The data are based on visual estimates where 6 = satisfactory control and 10 = complete kill.

Table 1.

Species	Herbicide						
	2,4-D				ATA		
	10	9	8	6	9	7	6
Russian thistle	-	18	8	3	-	-	240
Lamb's quarters	-	6	-	3	136	48	-
Wild buckwheat	60	-	40	29	93	89	45
Stinkweed	4	3	-	-	-	8	-
Flixweed	8	-	-	4	-	19	-
Alfalfa	-	7	-	-	-	58	-
Purslane	35	-	-	-	-	-	-
Common wild mustard	3	-	-	-	5	-	-

The amount of herbicides required (oz/A) to provide various percentages of kill of certain weed species are provided in Table 2.

Table 2

Herbicide		Weed species							
		Russian thistle				Wild buckwheat			
		95	90	80	70	95	90	80	70
2,4-D ester	1 treatment	-	44	23	-	55	35	30	24
" "	2 treatments	-	-	-	-	22	-	-	16
ATA	1 treatment	259	-	230	-	-	-	-	-
"	2 treatments	-	195	-	-	-	-	-	-
"	3 treatments	40	29	-	22	-	-	48	38

(Contribution from the Departments of Plant Ecology and Field Husbandry, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Herbicides for chemical summerfallow, 1957. Selleck, G. W., White, W. J. and Gerrie, J. H. The butyl ester of 2,4-D, and ATA and dalapon at initial rates of 8 lb/A, 20 lb/A and 30 lb/A active ingredients were applied to weeds in summerfallow with a logarithmic sprayer to quadruplicate plots 15 x 136 ft. The sprayer delivered 34 gal/A and the concentration of the herbicide decreased continuously along the length of the plot, so that the rate was halved every 21 ft. Dalapon and 2,4-D were used together for the control of broad-leaved and grassy weeds while ATA was used alone. The plants to be controlled included wild buckwheat, Russian thistle, stinkweed, lamb's quarters, alfalfa, Russian pigweed, blue bur, common wild mustard, flixweed, volunteer oats and wild barley. One group of plots for each herbicide remained untilled all season, while the weeds were controlled in other plots with a combination of chemical weed control and tillage. The first application of 2,4-D, ATA and dalapon was applied May 27, where weed control was attempted by chemical means alone. The remainder of the plots were disced the same day. Sufficient weed growth had occurred on these plots on July 3 to require chemical control. The ATA plots also received a second application at this date but no further treatment was necessary on plots treated with 2,4-D and dalapon (at effective rates) until July 23. A second application of 2,4-D was applied at this date, and a second application of dalapon was applied Aug. 28. These plots required only 2 applications each of 2,4-D and dalapon to provide adequate weed control at the effective rates throughout the entire season. Where plots were initially tilled, two subsequent treatments of 2,4-D and dalapon during the season were also necessary for adequate weed control. After an initial cultivation followed by an application of 2,4-D and dalapon one additional cultivation was necessary to control weeds for the remainder of the season. Three applications of ATA were necessary to provide weed control throughout the season on untilled plots. Two applications were necessary after the initial tillage on May 27, and two cultivations were required after an initial tillage followed by an application of ATA. One application of 2,4-D applied to the ATA plots did not alter the number of tillage operations required. Three tillage operations were necessary for weed control on the check plots. ATA or dalapon at 10 lb/A was not adequate for the control of wild barley. After one application, dalapon and ATA at 10 lb/A provided 95% and 25% control, respectively, of volunteer oats. Plants which survived produced an inflorescence even at the heaviest rates. The second application of dalapon applied Aug. 28 to new growth 4 in. high provided 100% control at 10 lb/A and 90% control at 4 lb/A. ATA at 10 lb/A controlled the volunteer oats 75% after the second and third applications. 2,4-D at 2 lb/A was sufficient to provide satisfactory control of the broad-leaved weeds present, but 5 lb/A was necessary for complete kill of all weed species. Where one application of ATA was applied, 15/A was required for adequate control of broad-leaved weeds. Good control was also obtained with three applications at 3 lb/A. (Contribution from the Departments of Plant Ecology and Field Husbandry, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Effects of various chemicals on control of Tartary buckwheat in barley. Vanden Born, Wm., and Corns, W. G. Plots containing both Tartary buckwheat and Gateway barley, seeded in separate rows on June 12, were sprayed on June 26 (stage 1) and July 6 (stage 2) with 2,4-D ester and LV 2,4-D ester at 4, 8, 12 oz/A, 2,4-DB ester at 8, 16, 24 oz/A, and neburon at 2.5, 5, 10 lb/A active ingredient. At stage 1 the barley was in 2-leaf stage (4"-5" high), and the buckwheat in the late cotyledonary stage. At stage 2 the barley was in 5-leaf stage (7" high), and the buckwheat plants had four true leaves. Treatment at stage 1 was in all cases more effective than the same treatment at stage 2, in reducing both dry weight and the number of surviving buckwheat plants. Neburon gave best control of Tartary buckwheat. Rates of 2.5, 5 and 10 lb/A resulted in 85%, 100% and 100% kill at stage 1. At stage 2 the only effective rate was 10 lb/A, giving 99% kill. Contrary to last year's results, the two 2,4-D esters showed about equal effectiveness in reducing the stand of buckwheat; rates of 4, 8 and 12 oz/A resulted in 45%, 65%, 70% kill, and 70%, 88%, 85% reduction in dry weight of buckwheat (expressed as % of check). Corresponding percentages at stage 2 were 14%, 32%, 45% kill, and 37%, 55%, 73% reduction in dry weight. 2,4-DB at 8 oz/A was equal in effect to the same rate of the 2,4-D esters. At stage 1, 16 and 24 oz/A rates of 2,4-DB were only slightly better than the lower rate, but at stage 2 the difference was more pronounced, the 24 oz/A rate resulting in 71% kill, and 86% reduction in dry weight. Barley yields of treated plots showed increases over check plot yields (13.9 bu/A) of 146-277 % in stage 1, and 116-196 % in stage 2. Highest yield (52.8 bu/A) was obtained following application of 2.5 lb/A of neburon at stage 1. 2,4-DB plots produced approximately 15% higher yields than did 2,4-D (38 bu/A) and LV 2,4-D (36 bu/A) plots presumably due to less crop damage. Bushel weights of barley were not significantly affected. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta).

Yields of barley in Tartary buckwheat-infested plots as affected by buckwheat density and method of weed control. Vanden Born, Wm., and Corns, W. G. Plots were seeded on June 18 to Gateway barley, and cross-seeded with Tartary buckwheat at a rate sufficient to give densities of 0, 25, 50 and 100 buckwheat plants per square yard, following thinning by hand. Treatments of plots containing the various densities of buckwheat included check, low volatile 2,4-D at 8, 12 oz/A, and removal of buckwheat plants by hand. Spraying and handweeding took place on July 9 when the barley had 4-5 leaves (6" high), and the buckwheat had 2-3 true leaves. Chemical treatments resulted in a slight delay in heading of the barley, and the failure of a number of heads to emerge properly. Buckwheat infestations of 25, 50 and 100 plants per square yard reduced barley yields from a check plot yield of 69 bu/A to 64, 49, and 28 bu/A, respectively; in other words, yields were reduced by 7, 28, 59%. Where buckwheat plants were removed by hand at spraying time, only the highest density (100 plants per sq yd) reduced barley yield significantly from that of a weed free plot (reduction 11 bu/A or 16%). Chemical treatment did not increase barley yield on plots with 25 or 50 buckwheat plants per sq yd, presumably due to crop damage. On plots with 100 buckwheat plants per sq yd application of 8 and 12 oz/A of LV2,4-D increased barley yield from 28 bu/A to 44 and 41 bu/A respectively, or increases of 57 and 47%. Bushel weight of barley was lowered slightly, but significantly, by the 12 oz/A treatment with 2,4-D. The 8 and 12 oz/A applications of LV 2,4-D resulted in 81% and 92% kill of buckwheat plants (ave. of all densities). The surviving plants were severely stunted, and their total dry weights reduced by 97 and 99%, respectively. (Division of Crop Ecology, Dept. of Plant Science, University of Alberta).

Comparison of some chemicals in the control of hempnettle. Vanden Born, Wm., and Corns, W. G. Plots seeded on May 16 to Victory Oats, had a natural infestation of hempnettle, and were sprayed on June 11 with MCP ester and 2,4-D ester at 6, 12 oz/A., and MCPB ester at 12, 24, 36 oz/A. At spraying time the oats were 6"-7" tall, and the hempnettle had 2-3 true leaves. 2,4-D was ineffective at both rates. MCP ester at 6 oz/A. gave some control, but the 12 oz/A rate was much more effective. MCPB ester gave a fair amount of control at 12 oz/A., and excellent control (95-100%) at both 24 and 36 oz/A. Extensive cutworm damage early in the season made analysis of variance of yield data impossible, but results obtained indicated a yield decrease on 2,4-D plots, and a yield increase of 22-53 % on MCPB and MCP-treated plots. Check plot yield was 82 bu/A., while a yield of 126 bu/A was obtained on plots treated with MCP ester at 6 oz/A. At the 12 oz/A rate MCP ester gave better control of hempnettle and resulted in a higher yield of oats (112 bu/A.) than did MCPB ester at the same rate (100 bu/A.). (Division of Crop Ecology, Dept. of Plant Science, University of Alberta).

SPRING SOWN GRAIN

Summary

W. J. Breakey

Twenty-eight abstracts were received of which eight were for inclusion in this summary; the remaining twenty will be reported under their proper headings. As in 1956, interest has centered on the chemical control of wild oats in cereal crops. A number of new chemicals were included in the trials this year.

Barley

Randox at 8 lb/A gave good control of wild oats but reduced the stand of barley 50% at first date of seeding, and 25% at second date one week later. However, this reduction in stand did not significantly reduce the yield of barley. I.P.C. at 10 lb/A reduced the yield of barley 50 and wild oats 50%.

Neburon sprayed on barley at 10 lb/A at the 4 to 5 inch stage of growth gave 100% control of Tartary buckwheat. The barley showed increase in yield but no effect on bushel weight.

LV 2,4-D ester sprayed on barley at rates of 8 and 12 oz/A gave 90% control of Tartary buckwheat and 40% increase in yield of barley over corresponding check.

Spring applications of E.P.T.C. and Simazin each at 10 lb/A reduced the yield of barley by 50% and the number of wild oats by 50%. Randox granular at 4 lb/A; 9025 at 10 lb/A and M757 at 10 and 15 lb/A did not measurably effect the number of wild oats on yield of barley.

Wheat

E.P.T.C. applied at 6 and 8 lbs/A; Simazin at 2 and 4 lbs/A one week previously to seeding wheat, gave good control of weeds but E.P.T.C. significantly reduced the yield of wheat.

E.P.T.C. and C.D.A.A. applied at rates of ½ to 8 lbs/A in 30 gal.water was toxic to the wheat and barley plants, but flax showed a high degree of tolerance. C.D.A.A. showed some damage to wheat and barley at rates required to control wild oats.

Neburon applied at rates of 4 and 6 lbs/A at two dates one week apart gave 100% kill of wild buckwheat in wheat with both rates.

MCP, 2,4-D and LV4 sprayed on wheat infested with wild buckwheat at 5 oz/A and at two week intervals gave 95 and 100% kills of the buckwheat. The MCP treatment gave increased yields,while the other two chemicals decreased yields of wheat.

Oats

Neburon at rates of 4 and 6 lb/A gave 100% control of wild buckwheat in Oats. The lower rate produced 1.4 bus. increase while the 6 lb. treatment yielded 3.0 bus/A less than the check.

Spring Rye

Concentrated Borascu (61.5% B203) at 1 lb. and D.B. Granular (43.2%, 7% 2, 4-D) at 0.5 lb/100 square feet, gave 35% and 45% control of toad flax in rye. Neither had any adverse effect on the rye.

Cultural

Incorporation by one-way discing or roto-tilling of chemicals had no clear-cut effect on the results.

Fertilizer applied to wheat gave significant crop responses but also caused wild oats to grow taller, produce a greater quantity of seed, and shatter 10-20% more seed than the check plots.

Abstracts

Comparison of various herbicides applied in the fall and in the spring for the control of wild oats. Friesen, H. A. On October 25, 1956 a number of herbicides were sprayed on barley stubble; the plot area carried a very heavy natural infestation of wild oats. Directly after spraying, 1/3 of each plot was one-way disced, 1/3 was roto-tilled while the remaining 1/3 received no tillage. On May 24, 1957 additional herbicides, receiving similar tillage treatments, were laid down. On May 29, 1957 the entire plot area was tilled, harrowed and seeded to Olli barley. Results. A preliminary plant count on the fall treated plots was made on May 22, 1957 prior to spring tillage and seeding. IPC at 10 lb/A; MCPA ester at 10 and 20 lb/A; 2,4-D ester at 20 lb/A; CDAA and CDEC each at 8 lb/A reduced the numbers of wild oats by as much as 70%. IPC at 5 lb/A; 2,4-D ester and 2,4-DB ester; Randox (granular) at 4 and 8 lb/A; CDEA at 8 lb/A; Neburon at 4, 8 and 16 lb/A; FW-450 at 20 lb/A; ATA at 10 lb/A; 2,4-dichlorophenoxyacetamide at 10 lb/A; and CMPC at 8 lb/A did not measurably reduce the wild oat population. Wild oats plant counts taken on August 23, 1957 indicated a similar trend but the reduction in wild oat plants was much less and failed to reach 40% as a result of any one treatment. Only MCPA ester at 10 and 20 lb/A significantly reduced the yield of barley. Spring applications of EPTC and Simazin each at 10 lb/A reduced the number of wild oats by 75% and the yield of barley by 50%. IPC at 10 lb/A reduced the wild oats by 50% and the barley yield by 50%. Randox at 4 and 8 lb/A; Randox granular at 4 lb/A; 9025 at 10 lb/A; and M757 at 10 and 15 lb/A did not measurably affect the number of wild oats or yield of barley. Incorporation by one-way discing or roto-tilling had no clear cut effect on the results. (Contributed by the Experimental Farm, Lacombe, Alberta).

"Randox" applied at various rates and methods of soil incorporation for the selective control of wild oats (Avena fatua). Friesen, H. A. On May 9, 1957, barley stubble known to be heavily infested with wild oats, was sprayed with Randox (2-chloro-N, N-diallylacetamide) at dosages of 2, 4 and 8 lbs/A. Water was used as a diluent at 10 gal/A. The granular form of "Randox" was included at a dosage of 4 lbs/A. Directly after the herbicides were applied $\frac{1}{4}$ of each plot was rototilled to a depth of 3-4 inches; $\frac{1}{4}$ was one-way disced 3-4 inches deep; $\frac{1}{4}$ was tandem disced twice to a depth of 1-2 inches; the remaining $\frac{1}{4}$ received no tillage. One-half of each tilled portion was then packed with a crowfoot packer. On the day of treatment a band of flax and barley was seeded across the various tillage treatments, Date 1. Subsequent seedings of barley were made 1 and 2 weeks later. Germination of wild oats was just beginning at the time of treatment. Results. Randox at 8 lb/A resulted in highly satisfactory control of wild oats regardless of method of incorporation into the soil. Plant counts showed that the stand of flax had been little affected at this dosage but the stand of barley at Date 1 was reduced by some 50%; at date 2 the reduction in stand was some 25%. However, this reduction in stand (Date 2) did not significantly affect the yield of barley. At date 3 the barley yield was increased markedly. The best stand and highest yield of flax was recorded on plots receiving the 8 lb/A dosage. The 4 lb/A dosage of liquid Randox reduced the wild

oats by nearly 40%, and similarly reduced the stand of barley sown at Date 1. The stand and yield of barley at dates 2 and 3 and flax were not affected. Randox, granular form, at 4 lb/A resulted in no reduction in stand of wild oats, flax or barley nor did it affect the yields of these crops. The plots treated with the 2 lb/A dosage was similar to the untreated check plot. (Contributed by the Experimental Farm, Lacombe, Alberta).

Treatment	Dates of Seeding	Wild Oats Plant Count in Barley & Flax							
		Rotto-Till		One-Way 2		Check		Double disc	
		Total	Ave.	Total	Ave.	Total	Ave.	Total	Ave.
	Flax	189	94	69	34	207	103	120	60
RANDOX	Date 1	6	3	16	8	22	11	2	1
	Date 2	35	17	74	37	57	28	41	20
2#/Acre	Date 3	4	2	23	11	8	4	6	3
	Flax	4	2	39	19	12	6	23	11
RANDOX	Date 1	2	1	14	7	8	4	3	1
	Date 2	25	12	7	3	10	5	8	4
4#/Acre	Date 3	17	8	13	6	7	3	13	6
	Flax	117	58	283	141	253	126	756	378
RANDOX	Date 1	52	26	103	51	37	18	16	8
Gran.	Date 2	229	114	78	39	63	31	56	28
4#/Acre	Date 3	24	12	32	16	3	1	4	2
	Flax	7	3	8	4	12	6	9	4
RANDOX	Date 1	4	2	3	1	0	0	15	7
	Date 2	4	2	0	0	1	0	10	5
8#/Acre	Date 3	27	13	17	8	32	16	36	18
	Flax	22	22	34	34	42	42	107	107
CHECK	Date 1	14	14	13	13	7	7	36	36
	Date 2			6	6				
	Flax			110	37				
CHECK	Date 1			41	14				
	Date 2			27	9				

Treatment	Dates of Seeding	Plant Count Barley & Flax								Yield of Barley		
		Rotto-Till		One-Way 2		Check		Double Disc		Total	Ave.Wgt. in grams	Bu./ Acre
		Total	Ave.	Total	Ave.	Total	Ave.	Total	Ave.			
	Flax	195	97	130	65	177	88	232	116	655	164	11.4
RAN-	Date 1	333	166	344	172	323	161	345	172	1309	327	26.4
DOX	Date 2	274	137	273	136	290	145	308	154	1745	436	35.2
2#/A	Date 3	227	113	221	110	305	152	300	150	1684	421	34.0

Treatment	Dates of Seeding	Plant Count Barley & Flax (cont.) Rotto-Till Total	Rotto-Till Ave.	One-Way 2 Total	One-Way 2 Ave.	Check Total	Check Ave.	Double Disc Total	Double Disc Ave.	Total	Yield of Barley Ave. Wgt. in grams	Yield of Barley Bu/ Acre
	Flax	206	103	234	117	240	120	214	107	743	186	12.9
RAN-	Date 1	123	61	168	84	157	78	106	53	1391	348	28.1
Dox	Date 2	180	90	191	95	165	82	144	72	1820	455	36.8
4#/A	Date 3	290	145	298	149	261	130	267	133	1619	405	32.7
	Flax	131	65	174	87	149	74	134	67	667	167	11.6
RAN-	Date 1	232	116	202	101	250	125	165	82	1598	374	30.2
Dox	Date 2	169	84	181	90	216	108	219	109	1881	470	38.0
Gran.	Date 3	289	144	334	167	380	190	379	189	1862	465	37.6
4#/A												
RAN-	Flax	264	132	281	140	270	135	265	132	926	231	16.0
Dox	Date 1	90	45	112	56	143	71	123	61	1816	454	36.7
8#/A	Date 2	212	106	194	97	180	90	158	79	2276	569	45.9
	Date 3	434	217	354	177	261	130	281	140	2111	528	42.7
	Flax	141	141	178	178	174	174	141	141	279	239	9.6
CHECK	Date 1	239	239	285	285	283	283	289	289	771	385	31.1
	Date 2			190	190					1041	520	42.0
	Flax			433	144					1135	789	13.1
CHECK	Date 1			312	104					2297	383	31.0
	Date 2			301	100					2796	466	37.7

Chemicals for control of Russian thistle (Salsola pestifer) in spring wheat. Sexsmith, J. J. Quadruplicate plots of Chinook spring wheat on silty clay loam at Lethbridge, Alberta, were treated with the following materials at the rates and growth stages specified, using a solution rate of 11.8 gal/A: dimethylamine of 2,4-D and diethanolamine of MCPA at 4, 8, and 12 oz/A, and a mixed ester of 4-(2,4-DB) at 8, 16, and 24 oz/A, applied at the 1- to 2-leaf stage of wheat growth; butyl ester of 2,4-D at 2, 4, and 8 oz/A, dimethylamine of 2,4-D at 4, 8, and 12 oz/A, mixed ester of 4-(2,4-DB) at 8, 16, and 24 oz/A, and a mixture of the butyl ester of 2,4-D at 4 oz/A with gibberellic acid at 20, 40, and 80 ppm, applied at the 3-leaf stage; double treatments with the butyl ester of 2,4-D at 2, 4, and 8 oz/A, dimethylamine of 2,4-D, diethanolamine of MCPA, and butyl ester of MCPA at 4, 8, and 16 oz/A, and mixed ester of 4-(2,4-DB) at 8, 16, and 24 oz/A, at the 3- and 5-leaf stages. The infestation of Russian thistle was light, and crop growth was somewhat spotty and variable as to growth stage. Weed control and crop injury ratings were taken immediately before harvest. Results: None of the treatments applied at the 1- to 2-leaf stage gave more than very poor control of Russian thistle (because of seed germination after time of treatment), nor did they cause much visible crop injury. The medium rates of treatments applied at the 3-leaf stage gave fair to good control of Russian thistle with but slight crop injury. The addition of gibberellic acid to a 4 oz/A rate of the butyl ester of 2,4-D lowered the effectiveness of the 2,4-D against Russian thistle without changing the effect of the herbicide on the crop.

The medium rates of the double treatments with the ester of 2,4-D and 4-(2,4-DB), and the amine of 2,4-D, gave excellent control of Russian thistle but caused moderate crop injury. The double application with both the amine and ester of MCPA gave very poor control of the weed but caused less severe crop injury than the other chemicals applied in double treatment. Significant crop yield reductions resulted from the double treatments with the ester and the amine of 2,4-D at the highest rate, and the ester of 4-(2,4-DB) at both the medium and high rates. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Mixtures of MCP and 2,4-D compared with each compound used singly for the control of hemp nettle, Galeopsis tetrahit. Friesen, H. A. Plots of wheat heavily infested with hemp nettle were sprayed with 2,4-D and 4-(2,4-DB) amine and ester; MCPA amine, ester and potassium salt; and 4-(MCPB) amine, ester and sodium salt each at 6 oz/A. Mixtures of MCPA and 4-(MCPB) ester and amine with2,4-D and 4-(2,4-DB) esters were prepared in ratios of 1:2 and 2:1 and sprayed at a total dosage of 6 oz/A. Assessment was based on weed counts, weed weights and yield of grain. The hemp nettle was mostly in the 4-leaf stage and the wheat in the 1 to 2 leaf stage at the time of spraying. Results: Each formulation of MCPA and 4-(MCPB) at 6 oz/A resulted in nettle kills of 60% with corresponding reductions in weight of weeds produced. The 2,4-D and 4-(2,4-DB) formulations resulted in little or no control of nettle. The mixtures which contained 4 oz/A of MCPA or MCPB approached the control obtained with these formulations used singly. The yield of wheat was depressed by the 2,4-D ester and amine as well as by the 2,4-DB ester and sodium salt. (Contributed by the Experimental Farm, Lacombe, Alberta).

Effect of herbicides on wheat yields 1957. Brown, D.A. Exp. A. The butyric acid form of 2,4-D and MCP was compared with MCPA (amine formulations) at recommended rates for the control of weeds in wheat underseeded with alfalfa. Rates of each treatment and corresponding yields of wheat were: 2,4-DB 16 oz/A., 38.6 bu; 24 oz/A., 35.9 bu; check, 40.6 bu. MCPB 16 oz/A., 40.1 bu; 24 oz/A. 39.0 bu; check 42.2 bu. MCPA 3 oz/A. 37.6 bu; 5 oz/A. 38.4 bu; check 37.1 bu. Statistical analysis proved that the only treatment significantly reducing the yield of wheat was 2,4-DB at 24 oz/A.

Exp. B. Selkirk wheat seeded in a test designed to study control of wild buckwheat was subjected to single and multiple doses of herbicides.

Treatment	Number of doses 1	2	3	Check no chemical
	bu/A.	bu/A.	bu/A.	bu/A.
2,4-D butyl ester 5 oz/A.	30.4	30.0	29.1	34.3
" " " 8 oz/A.	30.8	29.1	26.3	35.2
2,4-D IV.ethel ester 5"	34.1	30.8	29.8	34.7
" " " " 8"	31.2	31.1	26.2	33.4
MCPA ester 5"	33.1	32.1	32.5	36.2
8"	35.3	32.4	30.7	35.7
Mean of means	32.5	30.9	29.1	34.9

Analysis revealed significance among treatments and in the number of applications. (Contribution from Experimental Farm, Brandon, Man.)

The effect of borate compounds on toadflax in a field of rye, 1957. Selleck, G. W. Concentrated Borascu (61.5% B_2O_3) at 1 lb. and D.B.granular (43.2% B_2O_3, 7% 2,4-D) at 0.5 lb/100 sq.ft. were applied with a Cyclone grass seeder to toadflax in a crop of spring rye in duplicated 20 x 20 ft. plots on June 19, 1957. In August, these herbicides controlled the toadflax 35% and 45%, respectively. Neither herbicide appeared to have any adverse effect on the rye. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation.)

The effect of post-emergence treatment of eight herbicides on rape seed, 1957. Selleck, G. W. and J. F. Alex. Post-emergence applications of the dimethyl amine salt of 2,4-D, Diax (93% isopropyl amine salt of 2,4-D, 7% isopropyl amine salt of citric acid), the butyl ester of MCPA and the Na-K salt of MCPA at initial rates of 4 lb/A, the butyl ester of MCPB at 8 lb/A, 2,3,6-TBA, and the sodium salts of Dalapon and TCA at initial rates of 20 lb/A active ingredient were applied to rape seed on duplicated 16 x 136 ft. plots June 17 and July 4, 1957, with a logarithmic sprayer. The sprayer delivered 34 gal/A, and the concentration of herbicide was halved every 21 ft. The dates of spraying represented the five- to six-leaf and the early budding stages. The maximum dosages (oz/A) of these herbicides which reduced the yield and permitted seed production and minimum dosages which caused the death of rape seed are presented in the following table.

	Treatment 1			Treatment 2		
Herbicide	Death	Seed production	Normal Yield	Death	Seed production	Normal Yield
2,4-D amine	4.5	-	1	24	22	6
Diax	13	-	1	24	20	4.5
MCPB ester	21	33	8	125	45	9
MCPA ester	-	4.5	1	15	6	2
MCPA Na-K salt	13	9	2	54	23	2.5
2,3,6-TBA	78	48	6	105	32	6
Dalapon	No death	99	13	No death	83	19
TCA	No death	320	205	No death	320	135

Rape seed appeared to be more resistant to many of the herbicides in the early bud stage than in the five- to six-leaf stage. 2,4-D amine at 12oz/A, MCPB ester at 77 oz/A, MCPA ester and MCPA Na-K salt at 29 oz/A and 2,3,6-TBA at 6 oz/A were required to provide 90% control of Russian thistle at the first date of treatment. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

The effect of pre-seeding treatments of certain herbicides on rape seed, 1957. Selleck, G. W. and J. F. Alex. Pre-seeding treatments of CDAA spray at initial rates of 16 lb/A, and IPC and CDT at 24 lb/A active ingredient were applied to duplicated plots 16 x 136 ft. May 7, 1957, with a logarithmic sprayer. The sprayer delivered 34 gal/A, and the concentration

of herbicide decreased continuously along the length of the plot so that the rate was halved every 21 ft. CDAA granular at 2, 4 and 8 lb/A and 1,2, 4, 5-tetrachlorobenzene at 2.5, 5 and 10 lb/A active ingredient were applied with a 4 ft. Gandy spreader. The rape was seeded 1½ in. deep 4 days after the herbicides were double-disced into the soil to a depth of 2 in. The stand of rape seed was somewhat thinner and shorter on June 16, 1957, where CDAA spray at 16 lb/A and tetrachlorobenzene at 10 lb/A had been applied. By July 10 and throughout the remainder of the season these effects were barely visible. Adverse effects were not apparent from any of the other treatments. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.)

Fall Sown Grain and Sorghum

L. E. Anderson

Summary

Winter wheat. According to the study described by the single abstract submitted, TBA at 2 and 4 lbs. per acre and Karmex DW at 2, 3, and 4 lbs. per acre caused excessive injury when applied prior to emergence. No injury was evident before the late stages of growth had been reached.

Abstracts

The effect of TBA and Karmex DW on winter wheat. Nash, Russel L. Triplicate 2-sq. rod plots of winter wheat (Nebred) were sprayed on September 18, 1956, after the wheat had been planted (September 15) but before it was up, with TBA at 2 and 4 lbs. active ingredient per acre and Karmex DW at 1, 2, 3, and 4 lbs. of commodity per acre. The field was kept clean by summer fallowing during the 1956 season and no weeds were present at time of application. Wheat appeared to germinate and emerge without apparent injury from any of the treatments. However, when the plots were viewed in May and on June 12, there appeared to be considerable injury from some of the treatments. Both rates of TBA severely damaged wheat in the form of stunting and onion leaf effect on the lower leaves. Wheat in the untreated plots was four feet tall and in the TBA plots about two feet tall with heads about half the size as untreated heads. The 4 lb/A. rate of Karmex DW appeared not to cause stunting, but the lower leaves were dried up and many stems had no heads due to brittleness or weak straw. The 2 and 3 lb. rates also showed some injury similar to the 4 lb. rate, but in lesser amounts. Apparently there was no injury to the wheat at the one pound rate. Weeds in all plots appeared to be injured in proportion to the wheat. Rainfall for the 1957 season was above normal.

The results here indicate that TBA and Karmex DW at the higher rates were unsatisfactory as possibilities for controlling winter annual weeds in winter wheat. (Contributed by University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

Sorghum. Chemical applications as described by the abstracts included pre-emergence, coleoptile to 2-leaf stage, 6 inch and 29 inch stages of growth. Where irrigation followed pre-emergence application, monuron at 2 and 4 lbs., 3Y9 at 4 and 8 lbs., and NPA at 10 lbs. per acre gave excellent control of weeds. Of these treatments NPA caused severe reduction in yield. Although CDAA was outstanding at one location it was ineffective in the second study when used with irrigation.

Abstracts

Weed control in Reliance grain sorghum. Robinson, R. G., and Dunham, R. S. The sorghum was planted in rows 40 in. apart and cultivated 3 times. CDAA at 4 or 6 lb/A and simazin at 2, 4, or 6 lb/A were applied either in bands 13 in. wide over the sorghum rows at planting or overall 4 days later. CDAA at 4 or 6 lb/A; simazin at 2, 4, or 6 lb/A; DNBP, amine, at 4 lb/A; and diuron at 1½ lb + 2,4-D, amine, at ¼ lb/A were applied overall when the sorghum was in coleoptile to 2-leaf stage and the weeds were in the 2-leaf stage. Simazin at 2, 4, or 6 lb/A; diuron at 1½ + 2,4-D, amine, at ½ lb/A; 2,4-D, amine, at ½ lb/A; or 4-(2,4-D B), amine, at ½ or 1 lb/A were applied overall when the sorghum and Setaria were 6 in. tall. Dalapon at 1 lb + 2,4-D, L V ester, at ½ lb/A; ATA at 2 lb + 2,4-D, L V ester, at ½ lb/A; or DNBP, amine, at 4 lb/A were applied as a directed spray so that only the lower 8 in. of sorghum 29 in. tall were contacted.

Results: Simazin was too injurious to the sorghum except at 6 in. stage where it failed to give adequate control of Setaria. Diuron was too injurious also. DNBP at coleoptile stage gave good control of both grass and non-grass weeds with only slight injury to sorghum. Post-emergence directed sprays failed to give adequate control because the weeds were too tall. The 2,4-D, amine, and the 4-(2,4-D B), amine, gave excellent non-grass weed control with no injury to the sorghum.

CDAA was the outstanding herbicide at all rates and dates. The 4 lb rate was slightly less effective than 6 lb at the coleoptile stage. Non-grass weeds were not controlled but Setaria faberii, S. lutescens, and S. viridis were the predominating species. There was slight injury to the sorghum from delayed pre-emergence applications but no yield reductions are expected. Yields are not yet available but CDAA treatments appear to have increased them. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3848, Sci. Jour. Series, Minn. Agric. Exp. Station.)

Pre-emergence weed control in irrigated sorghum. Wiese, A. F. and Rea, H. E. In the spring of 1956 several chemicals were applied pre-emergence to sorghum planted in 30-inch rows in level borders. The chemicals and pounds per acre applied were: 2-chloro-N, N-diallylacetamide (CDAA) and Tris (2,4-dichlorophenoxyethyl) phosphite (3Y9) at 4 and 8; isopropyl N-(3-chlorophenyl) carbamate (CIPC) and sodium salt of N-1 naphthyl phthalamic acid (NPA) at 5 and 10; and 3-(p-chlorophenyl)-1, 1 dimethyl urea (monuron) and 3-(3,4-dichlorophenyl) - 1-methyl-1-n-butylurea (neburon) at 2 and 4. The experimental design was a randomized block with two replications. No rainfall or irrigations occurred until two weeks after chemical application when 3 inches of irrigation water was applied to the 1-inch sorghum. The crop received a total of 21 inches of rainfall or irrigation water. The sorghum treated with 4 and 8 pounds per acre of 3Y9, 2 and 4 pounds per acre of monuron, and 10 pounds per acre of NPA was weed free for the season and yielded 6203, 4810, 4043, 2998, and 139 pounds per acre, respectively.

Other chemicals did not give satisfactory weed control. The weedy check plots yielded 4287 pounds sorghum per acre. The least significant difference at the 5 percent level was 2100 pounds per acre. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA, cooperating.) Approved as TAES T. A. 2788.

CORN

Summary

Oliver C. Lee

The large number of abstracts relating to pre-emergence weed control is indicative of the increasing interest in this area. All of the abstracts received dealt with chemical weed control and considerable emphasis was placed on Simazin and its derivatives.

Pre-emergence treatments with Simazin resulted in 90-100% weed control from rates of 2 lb/A or more. In most cases, related compounds were no more effective in controlling weeds than was Simazin. Reduction in yield from higher rates was reported in one instance and residual injury to soybeans the following season was also noted. One investigator found no adverse effects on spring sown wheat and oats following Simazin. It is apparent that more information regarding residual effects of Simazin is needed before the herbicidal potential of this promising chemicalcan be fully evaluated.

In several instances EPTC-2, 4 and 8 lb/A gave satisfactory weed control with no appreciable injury to the corn. Band treatments, as well as the use of granular forms, continue to look promising.

Since CDAA has been cleared by FDA for use in corn, this herbicide was added to the list of recommended weed control treatments. This chemical, as well as 2,4-D, has been shown to be extremely sensitive to soil moisture. The treatments appear to be more effective when applied to a dry soil surface.

Only a few abstracts were concerned with post-emergence treatments. ATA, Diuron, 2,4-D and DNBP were the most effective. In one case Simazin-1 lb/A and ATA-1/2 lb/A applied at emergence, gave good weed control.

Abstracts

Control of annual weeds in corn by pre-emergence chemical treatment. Anderson, L. E. Corn planted on May 24 in a silt loam,alluvial soil was treated May 27 with various pre-emergence herbicides. Chemicals included in the study were EPTC (Ethyl N, N-di-n-propylthiolcarbamate) at 2, 4 and 8 lbs/A; Simazin (2-chloro-4, 6-bis-(ethylamino)-s-triazine) at 1, 2 and 4 lbs/A; and three Simazin-related compounds: 2-chloro-4-ethylamino-6-diethylamino-s-triazine, 2, 4, 8 lbs/A; and 2-chloro-4, 6 bis(isopropylamino)-s-triazine, 2, 4, 8 lbs/A; and 2-chloro-4-diethylamino-6-isopropylamino-s-triazine, 2, 4, 8 lbs/A. Treated plots were two rows wide and 42 feet long. No cultivation was used during the entire growing season.

Of the treatments included, Simazin at 4 lbs/A and 2,chloro-4-ethylamino-6-diethylamino-s-triazine at 8 lbs/A gave excellent control of annual weeds. Although corn plants did not appear to be injured by the chemicals, in both instances a reduction in yield was evident. By reducing the rates for Simazin and the related compound to 2 and 4 lbs/A weed control was less effective but satisfactory; yield for both treatments was increased by the lower rates. Other treatments included in the study did not give satisfactory control of weeds. (Contribution of the Kansas Agricultural Experiment Station).

The influence of pre-emergence treatments with simazin and several isomers on yields of corn and control of weeds. Bayer, D. E. and Buchholtz, K. P. The

results from three corn trials extending over two years were tabulated and are presented in the table. In 1956 corn hybrid W464A was planted on May 21 and in 1957 hybrid W530 was planted on May 22. Applications of the herbicides were made in all trials pre-emergence to the corn. At the time the herbicides were applied in 1956 the soil surface was dry and remained dry for the following 3 weeks. In 1957 the soil surface was moist at time of treatment and rainfall was abundant for several weeks afterwards. Plots were not cultivated during the season in any case except for the check plots which were kept weed free.

Material	Appl. lb/A	Corn yield--bu/A			Weeds--no/sq ft		
		1956	1957a	1957b	1956	1957a	1957b
Simazin	1	--	--	104.4	--	--	3.5**
	2	--	84.6	108.6	--	3.3**	1.0**
	4	96.5	--	105.4	1.6**	--	0.9**
27901	1	--	--	73.6**	--	--	54.8**
	2	--	--	98.0	--	--	10.9**
	4	--	--	103.7	--	--	2.8**
30028	1	--	--	96.7	--	--	5.8**
	2	--	--	87.7	--	--	6.3**
	4	--	--	96.0	--	--	5.1**
30031	1	--	--	83.3*	--	--	30.3**
	2	--	--	91.1	--	--	17.3**
	4	--	--	98.7	--	--	6.6**
CDT	4	79.6**	--	66.9**	12.3	--	84.3*
Diuron	2	94.9	73.0	100.9	5.7**	3.0**	2.9**
CDAA	4	97.8	51.6**	61.2**	3.8**	31.8**	59.9**
2,4-D	2	86.6*	43.2**	68.5**	4.2**	32.0**	68.7**
Weedy check	-	80.6**	35.8**	44.4**	15.2	64.8	100.1
Cult. check	-	98.7	86.5	104.4	--	--	--
LSD 5% level		10.2	15.0	18.7	Trans.	Trans.	Trans.
1% level		13.5	20.1	24.9			

Seasonal variations appeared to have very little effect on the activity of simazin (2-chloro-4,6-bis(ethylamino)-s-triazine) or diuron but had a drastic effect on CDAA and 2,4-D. In 1956 all four materials gave good weed control but in 1957 only simazin and diuron gave satisfactory weed control. In the 1957 trials grassy weeds predominated while in 1956 the weeds were approximately equal numbers of broadleaved and grassy types. Simazin maintained a weed free area in both years at the 4 lb/A rate and in 1957 at the 2 lb/A rate. A few grassy weeds appeared late in the season on the 1 lb/A rate. Plots treated with 30031 (2-chloro-4-diethylamino-6-isopropyl-s-triazine) and 27901 (2-chloro-4-ethylamino-6-diethylamino-s-triazine) had some regrowth of grassy weeds late in the season. 30028 (2-chloro-4,6-bis-(isopropylamino)-s-triazine) controlled broadleaved weeds and most annual grasses well, but appeared to be low in toxicity to fall panicum (Panicum dichotomiflorum). CDT (2-chloro-4,6bis(diethylamino)-s-triazine) was the least effective of the isomers included for the control of weeds. Corn yields on plots treated with simazin at rates of up to 4 lb/A were comparable to those obtained on weed free check plots.

In the spring of 1957, the area treated in 1956 was sown to spring wheat and oats to determine the residual of the simazin. No residual effect was detected prior to or at the maturity of the grains. (Dept. of Agronomy, University of Wisconsin, Madison).

Effect of various chemicals used pre-emergence on control of weeds and germination in sweet corn. Breakey, W. J. Sweet corn was planted June 5 on light sandy soil in 3 row plots, 3 feet apart and 40 feet in length. 0.62 inches of rain fell the week previous to planting and 0.57 inches the week after planting. CDAA and EPTC were applied at 4 and 8 lb/A in 10 gals water. M757 was applied in fine granular form at same rates by Gandy spreader. Check plots were used for each chemical and averaged 813 weeds per sq yard. Green foxtail, lambsquarters, redroot pigweed, field horsetail and stinkweed were the principal weeds present. Results: M757 gave no control of green foxtail (Setaria) at either rates. 50% control of broad-leaved weeds at both rates. The 4 lb rate of M757 gave better control of wild oats than the 8 lb rate. (Note: This result does not coincide with other tests where the 8 lb rate was much more effective). EPTC at the 8 lb rate gave 85% control of wild oats and 50% at the 4 lb rate, but gave no control of broad-leaved weeds at either rate. At the 8 lb rate EPTC gave 95% control of green foxtail, the 4 lb rate gave equally good control of this weed. CDAA at 8 lbs gave 45% control of wild oats, no control at the 4 lb rate, no control of broad-leaf at either rates; at 8 lb rate gave 90% control of green foxtail and 30% at 4 lbs. Germination or growth of the corn did not appear to be affected by any of the 3 chemicals. (Experimental Farm, Morden, Man.).

Effect of various chemicals used pre-emergence for the control of weeds in sweet corn. Breakey, W. J. Corn was planted May 29, on a sandy loam type soil in 3 row plots, 3 feet apart and 20 plants to the row. 0.41 inches of rain fell the week previous to planting and 0.61 inches the week after. Spraying was completed same day corn was planted. Simazin, CDAA (Randox) and EPTC were sprayed at rates of 3 and 5 lbs/A in 10 gals of water using cultivated and uncultivated checks in a randomized block design with four replications. Lambsquarters, stinkweed, redroot pigweed, buckwheat, green foxtail (Setaria) and purslane were the principal weeds. Results: The uncultivated checks averaged 179 weeds per square yard as against 7 weeds on the Simazin 5 lb rate treated plots, and 20 weeds at the 3 lb rate. CDAA averaged 66 weeds at the 5 lb and 88 weeds at the 3 lb EPTC at the 5 lb rate had a count of 105 and at the 3 lb rate 129. The cultivated checks were kept free of weeds. Simazin controlled both the broad and narrow leaf types. EPTC gave good control of green foxtail (Setaria) but no control of broad-leaved weeds. CDAA was partially effective against most weeds excepting wild buckwheat.

Yield Results: Yields of husked green corn from Simazin and CDAA treated plots at 5 lb rate were approximately 8 tons per acre, 1 ton higher than the 3 lb rate. Yield of ears from EPTC at both rates were significantly lower than with Simazin or CDAA. There was no significant difference in yield between the uncultivated checks and the EPTC treatments at either rate. Yield of ears from the Simazin and CDAA treated plots at the 5 lb rate was approximately 1.5 tons greater than the yield from the uncultivated check plots and 0.50 tons greater than the cultivated checks. Results from these trials indicate that Simazin was highly effective in controlling weed growth, but due mostly to favorable weather with above moisture conditions, the increase in yield of ear corn from the Simazin treated plots over the uncultivated checks was somewhat lower than anticipated. In observation plots 100 feet long, 15 feet wide, treated with Simazin at 8 lb/A the plot remained entirely free of weeds all summer. Germination and growth of corn was not affected. (Experimental Farm, Morden, Man.).

Effect of herbicides on fodder corn, 1957. Brown, D. A. Pre-emergence applications of Simazin at 3 and 6 lb/A and EPTC at 5 and 10 lb/A were applied broadcast to Nodak blend hybrid corn three days before emergence. Light harrowing followed the applications. Simazin at 6 lb/A kept the crop weed free through-

out the season. EPTC gave erratic results and did not appear satisfactory for weeds other than green foxtail. One set of check plots (no treatment) as well as the herbicide treated plots received no tillage whatever. Results: Simazin gave 90 to 100 percent control of all weeds present. Crop yielded 15.8 tons green weight per acre at the 6 lb. rate. EPTC at 10 lb/A gave a 60 percent control of all weeds. Corn on these plots yielded 12.5 tons/A. Hand weeded checks yielded 17 ton and weedy checks 8.7 tons per acre. Yields were principally influenced by the degree of weed infestation. Lambsquarters and red root pigweed were thick while green foxtail, sow thistle and Russian thistle were plentiful.

Post-emergence application of 2,4-D ester at 6 and 8 oz/A and 2,4-D amine at 8 and 10 oz/A were applied to the corn at two stages of growth (1) corn 6 inches, weeds seedling stage (2) corn 14 inches, weeds as high as 10 inches. Hand weeded checks were the only plots receiving any kind of tillage from the time the crop was planted through to harvest.

Results:

Treatment	Height when treated	Weed Control	Tons Green Weight
	inches	percent	per Acre
2,4-D ester 6 oz.	6	70-80	13.2
2,4-D ester 8 oz.	6	80-85	11.3
2,4-D ester 6 oz.	14	55-65	9.5
2,4-D ester 8 oz.	14	60-75	10.1
2,4-D amine 8 oz.	6	75-85	15.1
2,4-D amine 10 oz.	6	80-90	17.4
2,4-D amine 8 oz.	14	50-60	10.5
2,4-D amine 10 oz.	14	60-70	9.5
Hand weed Check		kept clean.	18.6
Weedy Check		heavy weed growth	8.7

As in experiment A degree of weed infestation was the main factor influencing yield. Broadleaves were well controlled but green foxtail flourished on the treated plots. Weeds were too far advanced to be satisfactorily controlled when corn was 14 inches high. None of the chemicals appeared to injure the corn in any way. (Contribution of the Experimental Farm, Brandon, Man.).

Herbicides on corn. Dowler, Clyde, Bondarenko, D. D., and Willard, C. J. Ohio W-64 corn was planted in 42-inch rows in a Miami-Brookston soil on May 28, 1957. German millet was sown to simulate annual grass. All plots had a natural infestation of redroot pigweed and lambs quarters. Triplicate 4-row plots were band-treated (20-inch bands) over the corn rows with each rate of each chemical. All rates except Karmex DL are given in terms of active ingredients and are overall rates so that the amount actually applied was one-half of these. All chemicals were applied in 40 gpa of water. Pre-emergence, May 29. 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (Karmex DL) at 2 pints/A; alpha-chloro-N,N-diallyacetamide (Randox) at 2, 4 and 6 lb/A; Randox-T at 2, 4 and 6 lb/A; PGBE ester of 2,4-D at 1½ lb/A; Randox at 2 and 4 lb/A plus 1 lb/A 2,4-D amine; CP6936, Monsanto at 3, 5 and 7 lb/A; 3,4-dimethylbenzophenone (3,4-DMB, Monsanto) at 6, 9 and 12 lb/A; 2-chloro-4,6-bis-(ethylamino)-S-triazine (Simazin) at 1, 2 and 4 lb/A; three experimental homologs of Simazin, G-30028, G-30031 and G-27901, Geigy, at 2, 4 and 8 lb/A; polychlorinated benzoic acids (ACP M-103-A and Hooker X-33EO) at 2 and 4 lb/A; ethyl-N,N-di-n-propylthiolcarbamate (EPTC) at 1, 2, 5, and 8 lb/A; tris-

(2,4-dichlorophenoxyethyl) phosphite (3Y9) at 2 and 4 lb/A; sodium salt of 2,4,5-trichlorophenoxyethyl sulfate (Natrin 80S) at 3 and 6 lb/A; gamma-2,4-dichlorophenoxy butyric acid (4-(2,4-DB) as the butyl ester at 1, 2 and 4 lb/A; and 2,4-dichlorophenoxyacetamide (Emid) at 2 lb/A. Emergence, June 4: alkanolamine salts of 4,6-dinitro-o-sec-butylphenol (DNBP) at 3 lb/A; 3-amino-1,2,4 triazole (ATA) at ½, 1 and 2 lb/A; Simazin at 1 and 2 lb/A; and Natrin 80S at 3 and 6 lb/A. Two true leaf stage, June 7: ATA at ½, 1 and 2 lb/A. 2-4 true leaves stage, June 11: Karmex DL at 2 pints/A; PGBE ester of 2,4-D at ¼ lb/A; 2,4-D amine at ½ lb/A; EPTC at 1, 2, 4 and 8 lb/A; sodium salt of 2,3,6-trichlorobenzoic acid (TBA, DuPont) at 1, 2 and 3 lb/A; ATA at 1 lb/A; and DNBP at 3 lb/A. Lay-by, spray striking the bases of the corn only, July 12: ATA and DNBP at 2 and 3 lb/A. The following pre-emergence treatments reduced the weed population by 90 per cent or more without injuring the corn, and were the most satisfactory: Randox at 2 and 4 lb/A, Randox-T at 2 lb/A, Randox at 2 lb/A plus 2,4-D at 1 lb/A, Simazin at 1 and 2 lb/A, EPTC at 4 lb/A, G-27901 at 4 lb/A, CP6936 at 7 lb/A, and Natrin 80S at 6 lb/A. The PGBE ester of 2,4-D at 1½ lb/A, ACP-103-A and 4-(2,4-DB) at 2 and 4 lb/A, Emid at 2 lb/A, 3Y9 at 4 lb/A, 3,4-DMB at 12 lb/A, Karmex DL at 2 pints/A, G-30028 at 2 lb/A, and G-30031 at 4 lb/A gave good control of the broad leaf weeds, but not millet. At emergence; ATA at ½ and 1 lb/A and Simazin at 1 lb/A gave good weed control. ATA at 1 lb/A gave satisfactory control of all weeds at the 2 true leaf stage. At the 2-4 true leaves stage Karmex DL gave excellent results. Other satisfactory treatments were TBA (DuPont) at 1 and 2 lb/A, ATA at 1 lb/A and DNBP at 3 lb/A. The PGBE ester of 2,4-D at ¼ lb/A and EPTC at 8 lb/A gave excellent control of the broad leaf weeds but not millet. DNBP at 3 lb/A was the only satisfactory lay-by treatment. Slight injury to corn resulted from some of the post-emergence treatments (Karmex DL and ATA) but recovery was apparently complete. (Contribution of the Ohio Agricultural Experiment Station).

Pre-emergence control of weeds in corn with herbicides applied early post-emergence. Freeman, J. F. Corn of Ky 105 hybrid was planted in Burgin silty clay loam soil June 13, 1957. Two days later a mixture of pigweed and german millet was solid seeded over the planted corn by means of a clover seed drill. Heavy rains fell shortly afterward and before the intended pre-emergence treatments could be made. The corn began emerging June 18 and the largest plants were 3 inches high with first true-leaf showing when spray treatments were made June 20. The treatments were 2-chloro-4,6-bis (ethylamino)-S-triazine (Simazin) 1, 2, 4 lbs/A; the related triazine compounds G27901 and G30031, each at 1.5, 3, and 6 lb/A; CDAA 3, 4, 5 lb/A and 3 lb + 0.5 lb 2,4-D as the PGBE ester; Alpha-chloro-n-ethyl-n-phenylacetamide (CP6936) 4, 5, 6 lb/A; 3, 4-dimethylbenzophenone (CP6840) 6, 12 lb/A; Ethyl N,N-di-n-propylthiocarbamate (EPTC) 3 lb/A, Neburon, 2 lb/A; 2,4-D as the PGBE ester, 1.5 lb/A cultivated check; and uncultivated check. Sprays were applied at rate of 32 gal/A. The experimental design was randomized block with 4 replications. The millet (simulating grass weeds) emerged a thick stand and pigweed a light stand where treatments did not prevent and growth was rapid in the continuing moist weather. The number of grass and broad leaf weeds was determined in each of 6 one sq ft quadrats at random in each plot July 12. Based on the number of weeds on the uncultivated check treatment which was 12.8/sq ft (11.3 grasses + 1.5 broad leaves) Simazin at 2 and 4 lb resulted in 100% control and at 1 lb rate, 99%; G27901 at 1.5, 3 and 6 lb/A gave 91%, 98%, and 100% control respectively, G30031 at like rates gave 50%, 91%, and 99% control; CDAA at 3, 4, and 5 lb/A resulted in 73%, 90%, and 95% control and the mixture of CDAA 3 lb + 2,4-D, 0.5 gave 100% control, CP6936 was similar in effectiveness to CDAA at like rates; CP6840 at 6 and 12 lb/A gave 80% and 98% control; EPTC at 3 lb resulted in 58% control; 2,4-D, 1.5 lb gave 99% control but resulted in some injury to the corn; Neburon at 2 lb gave 95% control of weeds. Although the plots were not cultivated throughout the summer few weeds came in where the treatments used gave effective early control. None of the treatments reduced stand of corn and growth

was retarded little except where 2,4-D was used at 1.5 lb/A. Yield data are not yet available. (Agronomy Department, Kentucky Agricultural Experiment Station).

Effect of several pre-emergence herbicides for weed control in corn. Friesen, G. Canning corn (variety Seneca Hybrid) was planted at two locations, Winnipeg and Morden, on weed infested land for the purpose of comparing several pre-emergence herbicides. Dates of planting and spraying were: at Winnipeg, June 6 and June 13; and Morden, June 1 and June 6. Weeds present at Winnipeg were wild oats, green foxtail, and wild mustard, while at Morden green foxtail predominated. The variable dosage sprayer delivering 30 gals/A total solution was used and all herbicides were applied at dosages continuous from $\frac{1}{2}$ to 8 lb/A. Treatments were conducted in duplicate with check plots adjoining each treatment.

Minimum dosages (active ingredient) required to give satisfactory weed control (at least 95% as compared to adjoining check) are presented in the following table:

	Wild oats	Green foxtail		Wild mustard
	Winnipeg	Winnipeg	Morden	Winnipeg
Herbicide	lbs/A	lbs/A	lbs/A	lbs/A
Simazin	3.36	2.72	2.70	1.28
Randox (CDAA)	3.36	.50	no control	2.72
Randox T	3.40	.89	5.20	.59
Vegadex (CDEC)	no control	no control	no control	5.36
Emid	3.30	2.16	no control	.50
EPTC	3.78	1.76	1.80	no control
CP-6840	--	--	no control	--
CP-13042	--	--	no control	--
3Y9	--	--	no control	--

Particularly good weed control was obtained with Simazin at both locations. Even at the lowest rates a good measure of control was obtained. Randox and Randox T gave excellent grass control at Winnipeg but not at Morden. EPTC was effective on grasses at both locations. Two herbicides caused considerable damage to the corn i.e. Emid at all rates, and 3Y9 at rates higher than 5.2 lb/A. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Herbicides for the control of giant foxtail in corn. Morre, D. J., Ingle, M., and Rogers, B. J. A wet silt loam soil located in West Central Indiana was treated with herbicides applied in 30 gpa water two days after corn was planted. Giant foxtail (Setaria faberii) was evenly distributed over the field and represented 98% of the weed infestation. CET (Simazin) at 2 and 4 lbs/A gave almost complete weed control whichpersisted throughout the growing season. 2,4-D-amide (Emid) gave excellent control (80-90%) at 4 lbs/A, but the corn was injured severely. CDAA (2, 4 lbs/A) and CDEC (4, 8 lbs/A) gave only mediocre control (40-50%). However, a second application of CDAA at 4 lbs/A applied 3 days later when the soil had dried gave excellent control (80-90%). (Dept. of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana).

Pre-emergence treatments for control of annual weeds in corn. Nash, Russel L. Corn was planted June 4. Six days later, when about 25% of the corn was just emerging, herbicides were applied pre-emergence in 20 gallons of water per acre. The soil surface was damp at the time of application and on June 13th, 0.25 of an inch of rain fell, 0.37 on the 14th, 0.30 on the 15th, and 0.48 on the

16th with 0.60 the remainder of June. Plots were 2 rows wide and 40 feet long. No cultivation was given any of the plots with the exception of the untreated plots that were kept weed free. Both grassy-weed and broadleaf-weed counts were made on July 24. Due to the late growing season, yields could not be taken in time to report. Listed below are the treatments and results of weed counts with the percentages based on weed control as compared to the untreated, uncultivated check and are the average of 4 replications.

Chemical	lb/A.	% control Grassy Weeds	% control Broad-leaf Weeds
Simazin	1	90.5	95.5
Simazin	2	98.0	99.2
Simazin	4	99.5	100.0
G-30044	2	83.2	84.0
G-30028	2	85.2	99.2
G-27901	2	87.7	95.0
G-30451	2	72.5	94.5
Granular Simazin	2	68.7	71.2
CDAA	6	82.0	50.0
EPTC	2	54.5	7.5
EPTC	4	86.2	46.2
EPTC	8	81.7	60.0
DNBP	6	71.2	84.2
DNBP	8	84.2	95.0
2,4-D isopropyl ester	1	77.0	96.0
2,4-D isopropyl ester	2	79.2	96.0
2,4-D ester plus CDAA	1 + 6	92.0	97.0

These results indicate that all chemicals used, except EPTC, could be considered as giving satisfactory results. CDAA applied alone was not too effective on broad-leaf weeds, but when used in combination with 2,4-D, the combination was satisfactory. Simazin was the most outstanding chemical used for both grassy and broadleaf weed control. It was difficult to get even coverage with the granular Simazin. (Contributed by University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska).

Pre-emergence weed control in corn on muck soil. Rogers, B. J. Plots on a muck soil located near Walkerton, Indiana, were treated with granular CDAA (4 lbs/A) and ethyl-N,N-di-n-propylthiolcarbamate (2 lbs/A) (both raked into the soil) before the corn was planted; 2,4-D ester (4 lbs/A), CET (Simazin) (2, 4, and 8 lbs/A), 2,4-D-amide (Emid) (4 lbs/A), and polychlorobenzoic acids (Benzac 103) (1 lb/A) were applied in 50 gal/A of water immediately after the corn was planted. The soil was dry. Principal weeds were Digitaria sanguinalis, Amaranthus sp., Chenopodium sp., Portulaca oleracea, Mollugo verticillata, and Polygonum sp. A standard treatment for annual weed control for corn in muck soil is 4 lbs/A of 2,4-D (followed by a cultivation at lay-by time). CET (Simazin) at 2 lbs/A gave slightly better weed control and at 4 and 8 lbs/A much better weed control than the 2,4-D. It is possible that CET at 4 lbs/A could eliminate the cultivation. CDAA (gran) gave somewhat better overall control than 2,4-D. The other three chemicals gave control about equal to that gained from the 2,4-D. (Dept. of Botany and Plant Pathology., Purdue University Agricultural Experiment Station, Lafayette, Indiana).

A comparison of the effectiveness of three triazine derivatives for annual weed control in corn. Rogers, B. J., Morre, D. J., Ingle, M. Three triazine derivatives were applied to a Chalmers silt loam soil located on the Purdue Agronomy Farm, Lafayette, Indiana. Application was made immediately after corn was planted. The soil was dry at the time of application, but rain fell the next day and the soil remained wet for the following week. The numbers represent total plants on 4 ft. sq. quadrats in triplicated plots. Counts were made 6 weeks after treatment. Geigy 30044 (2-methoxy-4,6-bis-(ethylamino)-s-triazine), Geigy 30031 (2-chloro-4-diethylamino-6-isopropylamino-s-triazine), and Simazin (2-chloro-4,6-bis-(ethylamino)-s-triazine) were tested:

Weed Species	30044		30031		Simazin				
Rate (lbs/A)	2	4	2	4	½	1	2	4	Check
Digitaria sanguinalis	18	3	33	17	16	8	3	1	45
Echinochloa crus-galli	4	0	7	1	4	1	0	0	5
Amaranthus sp.	13	3	1	0	0	0	0	0	15.5
Portulaca oleracea	0	1	0	0	0	0	0	0	2.3
Chenopodium sp.	0	1	0	0	0	0	0	0	5.6
Mollugo verticillata	17	2	0	0	0	7	0	0	82.8
Euphorbia sp.	0	0	1	0	0	0	0	0	2.0
Datura stromonium	0	0	1	0	0	1	0	0	3.4

There was no observable injury to the corn at the rates used. (Department of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana).

CET (Simazin) for annual weed control in corn inbreds. Rogers, B. J., Ingle, M., Nelson, O. E. Four acres of corn inbreds were sprayed with CET (Simazin) at 2.5 lbs/A in 20 gal water/A just prior to emergence of the corn. Soil was a Chalmers silt loam located at the Purdue Agronomy Farm, Lafayette, Indiana. Major weeds were Hibiscus trionum, Digitaria sanguinalis, Polygonum sp., Setaria sp., Mollugo verticillata, and Echinochloa crus-galli. The inbreds included Ohio 51, 51A, 07, 26, 43E, 44; 187-2; P-8; WF-9; H-14, H-49, H-50, 3811, C-103; Hy; and B-14. There was no visual evidence of injury to any of the inbreds. Tests will be run this winter on the viability and genetic quality of the seed. The chemical eliminated the need for cultural weed control for the entire growing season. This is in accord with testing done in 1956 with Simazin, when rates of 4 and 8 lbs/A gave perfect annual weed control which persisted into 1957. The soil residue was such that soybeans planted on May, 1957, in the 1956 plots were eventually killed on the 8 lb/A plots and stunted somewhat on the 4 lb/A plots. (Department of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana).

Pre and post-emergence applications of 2-chloro-4,6-bis-(ethylamino)-s-triazine (Simazin) at Halstad, Minnesota to control weeds in corn, flax, and wheat. Zinter, C. C., Amstrup, C. R. and Slough, A. T. Pre-emergence applications at 4, 2 and 1 lb active ingredient/A in 10 gal of water made in triplicate on date of seeding May 24, 1957. Post-emergence applications at same rates in triplicate June 19, 1957 with corn 6 in., wheat 6-8 in. and flax 5-6 in. high. 4 lb/A pre-emergence controlled all weeds present (Setaria, wild oats, rough pigweed, wild mustard). Wheat and flax were killed; corn showed no injury. Lower rates were not satisfactory. Post-emergence treatments gave some weed control, but in general were not satisfactory. Excess moisture conditions existed during June and July. Wild oat population was lower than desirable for test plot work. (Contribution of F. H. Peavey & Co., Minneapolis, Minn.).

FLAX

Summary

R. G. Robinson

Medium to heavy rates of 2,4-D or MCPA applied in high volumes of water (10-15 gal/A) tended to be less injurious to flax than when applied in low volumes (2 1/2 5 gal/A).

Dalapon at 1 lb/A or TCA at 5 lb/A gave excellent control of common and giant foxtails according to one abstract. Another investigator reported that neither dalapon nor monuron at rates up to 2 lb/A gave satisfactory green foxtail control, whereas TCA at 3-6 gal/A did give satisfactory control.

4-(2,4-DB) and 4-(MCPB) gave good results as non-grass weed killers in flax.

Abstracts

Herbicidal control of weeds in flax. Brown, D. A. 2,4-D butyl ester; MCPA ester; 2,4-D amine and MCPA amine were applied at rates of 3, 6 and 8 oz/A acid. 4-(2,4-DB) and 4-(MCPB) esters were applied at 8, 12 and 16 oz/A acid. Monuron and dalapon were applied at 1, 1 1/2, and 2 lb/A active; TCA at 3, 5 and 8 lb/A acid and in addition these latter three at each rate indicated, were applied in combination with 6 oz/A of MCPA ester. Applications were made at two dates (1) when flax was 2 in high and weeds very young (2) flax 6 in high and weeds past seedling stage. Results: Weed Control. Heavy infestations of lambsquarters, stinkweed and red root pigweed and lesser infestations of wild buckwheat, Canada thistle and perennial sowthistle were well controlled (86%) by the 8 oz rate of 2,4-D butyl ester and the 12 and 16 oz rate of 4-(2,4-DB) and 4-(MCPB). The MCPA ester at 8 oz gave an overall weed control of 78%, and the 2,4-D and MCPA amines 63%. The 6 oz/A rates were satisfactory especially with the 2,4-D butyl ester but the 3 oz rates were generally inadequate except for the control of lambsquarters and stinkweed. This was especially true of the amine formulations. Applications on date 2 were, on the overall average 12% less effective than those applied at the earlier stage of growth. Monuron and dalapon at all rates gave disappointing control of green foxtail. TCA gave fair to good control at the 2 lb/A rate and satisfactory control at the 3 and 6 lb rates. Flax Yields. Effect on yield was somewhat obscured by the prevalence of disease. However, in the overall picture plots treated date 1, averaged 6.8 bu/A compared with 5.9 bu/A for those treated at the later growth stage. At an average of all rates the various chemicals were rated according to yield as follows. 4-(MCPB) ester at the top with 7.2 bu/A followed by monuron alone and in combination with MCPA ester at 7 bu, then in descending order 2,4-D amine; MCPA amine; combination of TCA and MCPA ester; MCPA ester; 2,4-D ester; dalapon and TCA alone; dalapon and TCA in combination with MCPA ester; and finally 4-(2,4-DB) ester at the bottom with 5.2 bu/A. Hand weeded plots yielded 6.7 bu/A and weedy checks 5.6 bu. As a result of this extensive experiment in 1957, while some reduction in yield can be expected, the most satisfactory weed control in flax can be obtained from a combination of 3 to 5 lb/A of TCA and 6 oz/A of MCPA ester if there is a strong mixture of green foxtail and broad leaved weeds. If foxtail is not a problem 4 to 6 oz of MCPA ester or 8 to 12 oz/A of 4-(MCPB) promise good results when applied at an early growth stage. (Contribution from Experimental Farm, Brandon, Man.). Approved for publication.

Influence of volume of water when spraying flax. Brown, D. A. 2,4-D ester and MCPA ester were applied at 3, 6 and 8 oz/A in volumes of 5, 10 and 15 gal/A of water when flax plants were 3 in high. Results: Yields flax. 2,4-D ester 5 gal/A 6.7 bu; 10 gal 7.4; 15 gal 7.5 and untreated check 7.4 bu. MCPA ester 5 gal/A 6.6 bu

10 gal 8.1; 15 gal 7.1, and untreated check 6.4. Yields were mathematically significantly lower at the 5 gal volume of water than at the high volumes. No significance was revealed between the 10 and 15 gal volumes. In rates times volume of water there was a measurable difference favoring the higher volumes of water at the 8 oz/A rate but not at the 3 and 6 oz/A rates. (Contribution from the Experimental Farm, Brandon, Man.). Approved for publication.

Effect of volume of water on damage from 2,4-D and MCPA on flax. Molberg, E. S. 2,4-D ester, 2,4-D amine, and MCPA ester were applied to Rocket flax in 2 1/2 5 and 15 gal water/A. Each chemical was applied at 3 rates, a low rate suitable for susceptible weeds, a medium rate suitable for use on perennials in the growing crop, and a high rate designed to ensure some damage to the flax. Plots were 12 x 27 ft. in size and arranged as a randomized block on 4 replicates. Observations during the growing season indicated severe damage from the medium and high rates of 2,4-D in low volumes of water. Damage lessened as the volume of water was increased. The 2,4-D ester caused the most damage and MCPA ester the least. The plants recovered some from the damage so that the differences in yields were not as large as expected. The treatments given and the yields in bu/A were as follows:

Chemical and Rate	Volume of Water			Check
	2 1/2 gal	5 gal	15 gal	not sprayed
3 oz 2,4-D ester	11.3	11.6	11.2	
6 oz 2,4-D ester	9.5	10.7	13.2	
10 oz 2,4-D ester	9.6	10.0	11.5	
4 oz 2,4-D amine	12.6	12.8	11.4	
8 oz 2,4-D amine	10.5	12.4	12.3	
12 oz 2,4-D amine	9.9	12.3	10.7	
4 oz MCPA ester	10.6	10.7	10.9	
8 oz MCPA ester	11.8	10.3	12.0	
12 oz MCPA ester	12.4	12.0	13.6	
Check not sprayed				10.4

(Contributed by the Experimental Farm, Regina, Sask.)

Giant foxtail control in Marine flax. Robinson, R. G., Jordan, L. S. and Dunham, R. S. Pre-emergence applications of CDAA at 4 lb/A, EPTC at 5 lb/A, and simazin at 3 lb/A were made 4 days after sowing flax. The CDAA and EPTC plots were sprayed with MCPA at 1/4 lb/A a month after sowing. Results: Simazin killed all vegetation. Both CDAA and EPTC failed to control weeds satisfactorily although EPTC gave early control of foxtail.

Post emergence applications of TCA at 5 lb/A or dalapon at 1/2, 2/3, or 1 lb/A were made on flax 3 in tall and foxtail 1 in tall. These plots were sprayed also with MCPA at 1/4 lb/A. Results: Dalapon at 1 lb or TCA at 5 lb gave excellent control of foxtail without injury to the flax. At 2/3,lb control was slightly less but satisfactory. At 3 branch stations, similar results were obtained with dalapon and TCA on green and yellow foxtail.

Post emergence applications of 4-(2,4-DB), amine, at 1/2 lb/A; 4-(2,4-DB), ester, at 1/2 lb; or 4-(MCPB), amine, at 1/2 lb were made to flax 3 in tall and nongrass weeds in 1- to 2-leaf stage. These plots were also sprayed with dalapon at 1 lb/A which eliminated the foxtail. Results: None of the butyrics was injurious to flax. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota; St. Paul, Minn. Paper No. 3849. Sci. Jour. Series, Minn. Agric. Exp. Station).

Soybeans

Summary

F. W. Slife

Weeds are best controlled in soybeans by cultural practices, but several pre-emergence herbicides have performed consistently enough to be recommended in problem areas.

From the abstracts submitted this year, it appears that EPTC will not be useful in soybeans because of the injury it causes. Two investigators reported that several of the hydrazine derivatives damaged soybeans at rates necessary to control weeds. Older pre-emergence chemicals, such as CDAA, NP, DNBP, AND CIPC, performed satisfactorily but not consistently in all cases.

Two abstracts reported that early post-emergence applications of DNBP had given excellent control of weeds with no damage to soybeans. The most successful applications appear to be those made at the cotyledon stage; late applications may or may not injure the soybeans.

Abstracts of Results of Cooperators

Effect of herbicides used pre-emergence for the control of weeds and effect on germination of soybeans. Breakey, W. J. Soybeans were planted June 5 on sandy-type loam soil in 3-row plots 3 feet apart and 40 feet long. 0.62 inch of rain fell the week before and 0.57 inch the week after planting. CDAA and EPTC were applied at rates of 4 and 8 lb/A in 10 gallons of water. M757 was applied in fine granular form at the same rates by using a Gandy spreader. Check plots were used for each chemical and averaged 1,046 weeds per square yard.

Results: At the 4 lb rate M757 averaged 766 weeds; EPTC, 279; and CDAA, 486. At the 8 lb rate the weed count was M757, 918; EPTC, 135; and CDAA, 252. At the 8 lb rate M727 gave 45% control of wild oats, no control of green foxtail, and 50% control of field horsetail (Equisetum arvense). EPTC gave 95% control of green foxtail and 79% control of wild oats. CDAA gave 93% control of green foxtail and 57% control of wild oats. In general, the 4 lb rate of application was less than 50% as effective at the 8 lb rate.

Germination: Soybeans showed retarded germination, dwarfing, and leaf curling from EPTC and CDAA at the 8 lb rate of application. At the 4 lb rate, damage was observed on the EPTC treatment only and was much less severe than at the 8 lb rate. (Experimental Farm, Morden, Man.)

Herbicides on soybeans. Dowler, Clyde, Bondarenko, D. D. and Willard, C. J. Hawkeye soybeans were planted in 42-inch rows in Miami-Brookston soil on June 3, 1957. German millet was sown to simulate annual grasses. All plots had a natural infestation of redroot pigweed. Triplicate 4-row plots were band-treated (20-inch bands) over the soybean rows with each rate of each chemical. All rates are given in terms of active ingredient and are over-all rates, so that the amount actually applied was one-half of these rates. All chemicals were applied in 40 gpa of water.

Pre-emergence, June 4: PGBE ester of 2,4-D at 1 1/2/A; alpha-chloro-N, N-diallylacetamide (Randox) at 3, 4, and 6 lb/A; sodium N-1-naphthyl phthalamate (Alanap-3) at 2, 4, and 6 lb/A; isopropyl-N-(3-cholorophenyl) carbamate (CIPC) at 4, 6, and 8 lb/A; Alanap-3 + CIPC at 2 + 2, 3 + 3, and 4 + 4 lb/A; two experimental homologs of Simazin, G-30028 and G-30031, Geigy, at 2, 4, and 8 lb/A; another, G-27901, Geigy, at 4 lb/A;

ethyl-N,N-di-n-propylthiolcarbamate (EPTC) at 1, 2, 4, and 8 lb/A; 3,4-dimethylbenzophenone (3,4-DMB, Monsanto) at 6, 9, and 12 lb/A; CP6936, Monsanto, at 3, 5, and 7 lb/A; and Randox-T at 2, 4, and 6 lb/A.

Cotyledon stage, June 11: alkanolamine salts of 4,6-dinitro-o-sec-butylphenol (DNBP) at 1 1/2, 2 1/4, and 3 lb/A; and the dimethylamine salts of the gamma phenoxybutyric acids 4-(2,4-DB) and 4-(MCPB) at 1/2, 1, and 2 lb/A.

First true-leaf stage, June 13: DNBP at 1 1/2, 2 1/4, and 3 lb/A; EPTC at 1, 2, 4, and 8 lb/A; and butoxyethanol ester of 2,4-DP at 1/2, 1, and 2 lb/A.

2-4 true-leaves stage, June 18: DNBP at 1 1/2, 2 1/4, and 3 lb/A; 4-(2,4-DB) and 4-(MCPB) at 1/2, 1, and 2 lb/A.

The following pre-emergence treatments reduced both the pigweed and German millet population by 90% or more without injuring the soybeans and were the most satisfactory: Randox at 3 lb/A, Alanap-3 at 4 lb/A, CIPC at 8 lb/A, Alanap-3 plus CIPC at 2 + 2 lb/A, EPTC at 4 lb/A, 3,4-DMB at 12 lb/A, and CP-6936 at 3 lb/A. The PGBE ester of 2,4-D at 1 1/2 lb/A gave excellent control of pigweed but only fair control of millet. G-27901, G-30028, G-30031, and Randox-T caused severe soybean damage. At the cotyledon stage, DNBP at 3 lb/A and 4-(MCPB) at 2 lb/A gave good control of weeds with no injury to the soybeans. All other post-emergence treatments resulted in poor weed control or severe soybean damage. (Ohio Agricultural Experiment Station)

Early weed control in soybeans with herbicides used pre-emergence. Freeman, J. F. Clark soybeans were planted June 14 on moist Burgin silty clay loam soil. German millet to simulate annual grass weeds and pigweed was seeded solid over the soybean plantings with a clover seed drill the following day. Herbicides were applied to the soil in water sprays on June 17 after the beans had begun to germinate and before they had emerged above ground. Heavy rains fell a few hours after treatments were applied. Materials and rates per acre were: DNBP as alkanolamine salt, 6 lb; NPA as the sodium salt, 3 and 4 lb; ethyl N,N-di-n-propylthiolcarbamate (EPTC), 3 lb; CDAA, 3 and 4 lb, and 4 lb + 2,4-D ester, 0.5 lb; alphachloro-n-ethyl-n-phenyl acetamide (CP6936), 4, 5, and 6 lb; 3,4-dimethylbenzophenone (CP6840) 6 and 12 lb; the triazine compounds, G-30031 and G-27901, each at 1.5, 3, and 6 lb; Neburon, 2 lb; and cultivated and uncultivated checks.

Treatments were in a randomized block design with four replications. Each herbicide was applied in water at 32 gal/A. Cultivated check plots were cultivated on July 2. The weeds were millet and pigweed, with millet predominant. The number of grass and broadleaf weeds in each of six 1 sq ft quadrats located at random in each plot was determined on July 11. All of the plots were clean cultivated, and weeds in the row were removed one week later.

Results: Soybeans have not yet been harvested as this is written. Based on the uncultivated check, which had 20 weeds/sq ft (17 millet or other grasses + 3 pigweed), the EPTC at 3 lb/A resulted in better than 95% weed control with slight reduction in height and moderate reduction in stand of the crop. At the 3 lb rate, weed control was slightly poorer and injury to the crop slightly less. CDAA at 4 lb/A and CP6936 at 6 lb each resulted in 80% control of weeds with little reduction in height or stand of soybeans. Lower rates of either gave poorer control of weeds. CP6340 at 12 lb/A gave 75% weed control--slightly poorer than that for CDAA at 4 lb--but at the 6 lb rate weed control was very poor. There was little apparent harm to the crop from its use. Neburon at 2 lb/A resulted in 55% control of weeds and little apparent injury to the crop. DNBP at 6 lb/A gave only 50% control. The triazine compounds

G-30031 and G-27901 gave poor weed control at rates that caused little or moderate injury to the crop. (Agronomy Department, Kentucky Agricultural Experiment Station)

The effect of early post-emergence DNBP sprays on soybeans. Slife, F. W. and West, S. H. Hawkeye soybeans were treated at four stages of growth with four rates of the amine salt of DNBP. Rates used were 1, 2, 3, and 4 qt/A. Treatment stages were (1) cotyledons emerging, (2) cotyledons unfolded, (3) first two true leaves unfolded, and (4) first trifoliate leaves unfolded. Daytime temperatures during treatment period ranged from 82 to 89 degrees.

Excellent weed control resulted from the first treatment even though only a few grasses and broadleaf weeds were visible. Rates as low as 1 qt/A gave exceptionally good control. No visible soybean injury resulted from the first treatment. Two, 3, and 4 qt/A of DNBP gave good control of weeds at the second treatment date without injuring soybeans. At the third treatment date, temperatures of 87 degrees were recorded for several days following treatment. A rate as low as 1 qt/A burned the two true leaves off the soybean plants. It was interesting to note, however, that these plants recovered very rapidly; although their height was shorter, the indications are that yields will not be reduced greatly even at the 4 qt rate.

Weed control was good at the third treatment date at the 3 and 4 qt rates but poor at the 1 and 2 qt rates. At the fourth treatment date, all rates injured the beans and reduced their height below that of the untreated checks. It would appear that yields will be reduced substantially at the 3 and 4 qt rates. Weed control was good only at the 4 qt rate. Yields have been harvested but not calculated at this date. (Illinois Agricultural Experiment Station)

Herbicide evaluation for weed control in soybeans. Peters, E.J. and Kerr,H.D. Several pre-emergence and post emergence herbicide treatments were applied to three replications of Clark soybeans planted on May 7 at Columbia, Missouri. The herbicides were applied in 40 gallons of water per acre. All plots received two cultivations. Soybean stands in 9 feet of row and weed stands in 4.5 sq. ft. per plot were determined. Twenty-five feet of row was harvested in each plot and yields were expressed in bushels per acre. DNBP at 7½ lbs. and Neburon at 3 lbs. per acre, applied pre-emergence on May 11, gave highly significant reductions of soybean stands. No significant reduction in stand occurred from pre-emergence treatments with 5 and 10 lbs. of EPTC or 4 lbs. of CDAA, 20 lbs. of PCP (Na) and 2 lbs. of Neburon although in the later two treatments the stand reduction approached significance.

No reduction of soybean stand occurred from post emergence treatments with 2 or 3 pounds of DNBP applied on May 15, when the soybean cotyledons were completely above ground, or from these treatments applied 5 days later. However, soybean leaves were severely burned by the late treatments. None of the pre-emergence or post emergence chemicals caused a significant increase in the yield of soybeans over the check. Neburon at 3 lbs. per acre was the only treatment that significantly reduced the yields of soybeans.

Weed species present were Amaranthus, and Polygonum spp., Abutilon theopharasti and Digitaria spp. Significant weed control was obtained with all chemicals. (Crops Research Division, ARS, U.S. Department of Agriculture and Missouri Agricultural Experiment Station cooperating).

Forage Legumes

Paul F. Sand

Summary

The most commonly used chemicals on legumes were dalapon, TCA, MCPA, 2,4-D, 4-(MCPB), 4-(2,4-DB) and EPTC. Fourteen abstracts were received from ten locations.

Results from treatment with 4-(2,4-DB) at 1/2 to 1 lb/A show good kills of many broad-leaved weeds with little or no injury to alfalfa. The esters are somewhat more effective on weeds than the salt formulations and 4-(2,4-DB) is more effective than 4-(MCPB). However, alfalfa was injured more by 4-(MCPB) than by 4-(2,4-DB) when the chemicals were applied as post-emergence treatments. In one test a pre-emergence treatment of 4-(2,4-DB) at 2 lb/A killed 95% of the alfalfa. Another report indicates that MCPA, 4-(MCPB) and 4-(2,4-DB) at 1 lb/A killed 90-95% of seedling sweet clover plants when applied at the two and five leaf stage of growth.

Dalapon and TCA at rates of 1 to 2 lb/A and 5 to 8 lb/A respectively gave good weedy grass control when applied at early stages of growth with little or no injury to alfalfa in most instances. Yet in one case dalapon at 3 lb/A and TCA at 6 lb/A seriously reduced stands of alfalfa and sweet clover when applied following harvest of a nurse crop of oats or flax. In another experiment, dalapon at 3 lb/A and TCA at 8 lb/A applied as pre-emergence treatments reduced the stand of alfalfa 25% and 75% respectively. On the other hand, in the same experiment the same rates of these two chemicals applied when the alfalfa had 1-2 true leaves caused very little injury.

Mixtures of dalapon at 1 to 2 lb/A and 4-(2,4-DB) at 1/2 to 1 lb/A successfully controlled both weedy grasses and broad-leaved weeds.

Five varieties of alfalfa (Buffalo, Grimm, Ladak, Ranger, and Vernal) treated with 4-(2,4-DB) and dalapon separately and as a mixture showed no differential response to either chemical. Stand and/or yield of alfalfa was increased from the higher rate of dalapon (8 lb/A) or a mixture of the two chemicals.

Several legumes - alfalfa, birdsfoot trefoil, red clover, sweet clover and alsike clover - were pre-emergence treated with EPTC at rates ranging from 3 to 8 lb/A. Weed control ranged from poor to excellent and none of the legumes were injured. In one test excellent weed control was reported from an early post-emergence treatment of EPTC. Most species of weedy grasses were controlled by this chemical but some species of broad-leaved weeds were not.

Abstracts

Herbicidal Control of Weeds in seedling stands of Alfalfa and Sweet Clover. Brown, D. A. Ladak Alfalfa and commercial white blossom sweet clover were used in this test under-seeded with wheat. Herbicides used were MCPA amine at 3 and 5 oz/A, MCPB and 2,4-DB sodium salts at 16 and 24 oz/A. Applications were made at two stages of growth (1) legume seedlings 2 inches (2) legumes seedlings 5 inches. Results: Stage of growth appeared to make little difference in 1957. Alfalfa withstood the herbicide very well. The MCPB and 2,4-DB at the 24 oz/A rate was the only treatment that significantly reduced the stand of the legume. The 16 oz/A rate of MCPB and 2,4-DB killed weeds satisfactorily and did not unduly injure the alfalfa. The MCPA amine slightly reduced the stand of alfalfa at the 5 oz/A rate but gave little or no evidence of injury at the 3 oz/A rate. A heavy infestation of lambsquarters, red root pigweed, some wild buckwheat, stinkweed and tansy mustard were the principle

weeds. The MCPA amine even at 5 oz/A was not of sufficient strength to control red root pigweed. At the 16 oz/A rate the MCPB and 2,4-DB gave satisfactory weed control. Higher rates appeared superfluous. Sweet Clover was much more severely injured by the herbicides than in any of the previous seven years tests. MCPA amine left a 35 percent stand at the 3 oz rate and 25 percent at the 5 oz/A rate. MCPB and 2,4-DB acted similarly. At the 16 oz/A rate only 5 to 10 percent of the legume plants remained. Only a trace of clover was left at the 24 oz/A rate. (Contribution of the Experimental Farm, Brandon, Manitoba.)

Annual weed control in new seedings of birdsfoot trefoil and an alfalfa-red clover mixture. Churchill, B. R. Pre-emergence treatments included CDAA 4 lbs, EPTC 6 lbs, neburon 2 and 4 lbs, and dalapon 2 lbs. Post-emergence treatments included MCP 1/2 lb, MCPB 1/2, 1, 2, 4 lbs, 2,4-D 1/2 lb, 2,4-D 1/2 lb, 2,4-DB 1/2, 1, 2, 4 lbs, neburon 2 lbs, dalapon 2, 4 lbs. Several combinations of chemicals as pre-emergence, as post-emergence, and as pre-post-emergence were made which involved all of the above chemicals. The three weeks period before and the three weeks period following pre-emergence spraying were very wet. Botanical analyses were made of each plot as to broad-leaved weeds, grassy weeds, trefoil, alfalfa and red clover. A score was determined by dividing the dry weight of the legume by the total dry weight of weeds for each treatment. For trefoil, the scores ranged from 113 to 3. The five best treatments in order were dalapon 2 lbs post-emergence plus 2,4-DB 1 lb post-emergence; neburon 2 lbs pre-emergence plus dalapon 2 lbs post-emergence; dalapon 2 lbs pre-emergence plus 2,4-DB 1 lb post-emergence; neburon 2 lbs pre-emergence plus dalapon 2 lbs post-emergence; neburon 2 lbs pre-emergence plus 2,4-DB 1 lb post-emergence.

For alfalfa (in the alfalfa-red clover mixture) the scores ranged from 249 to 14. The five best treatments were: Neburon 2 lbs pre-emergence plus dalapon 2 lbs post-emergence; neburon 4 lbs pre-emergence; Dalapon 2 lbs post-emergence plus MCPB 1 lb post-emergence; dalapon 2 lbs post-emergence plus 2,4-DB 1 lb post-emergence; neburon 2 lbs pre-emergence.

For red clover (in the alfalfa-red clover mixture) the scores ranged from 55 to 0. The five best treatments were: MCPB 2 lbs post-emergence, 2,4-DB 1 lb post-emergence, MCPB 1/2 lb post-emergence, MCPB 4 lbs post-emergence, EPTC 6 lbs pre-emergence plus 2,4-DB 2 lbs post-emergence. Hay yields will be harvested in 1958. (Contribution of the Michigan Experiment Station.)

Birdsfoot trefoil establishment in quackgrass sods. Churchill, B. R., and Tesar, M. B. Treatments included dalapon at 10 and 15 lbs and TCA at 25 and 40 lbs per acre. Treatments were applied fall or spring on the grass about two weeks before plowing. The trefoil was seeded as soon as possible after plowing and fitting. Three separate experiments in different areas (all in the eastern end of the Upper Peninsula of Michigan) are in progress. Fall applications have been less effective than spring treatments for control of quackgrass in this area. Dalapon has been less effective than TCA at the rates used in these tests. TCA at 25 lbs per acre applied in early spring has been the most satisfactory treatment. Botanical analyses of the first cutting in 1957 showed 73.7, 21.2, and 3.2 percent of quackgrass in check, dalapon, and TCA plots respectively. (Contribution of the Michigan Experiment Station.)

Herbicides on seedling alfalfa, birdsfoot trefoil and red clover. Dowler, Clyde and Willard, C. J. Kansas common alfalfa was bandseeded at 12 lb/A on April 25, 1957, and July 25, 1957. A mixture of European and Empire birdsfoot trefoil at 8 lb/A was bandseeded in split plots with the spring-seeded alfalfa so that both the alfalfa and birdsfoot trefoil received the same treatment. Common ryegrass

and wild mustard were sown as weeds in the spring seeding and German millet was sown as a grassy weed in the summer seeding. The spring seeding had a natural infestation of foxtail, the summer seeding of purslane, and all plots had infestations of redroot pigweed and lambsquarters. All treatments were applied in triplicate in 40 gpa of water. Pre-emergence, April 27: dimethylamine salts of the gamma-phenoxybutyric acids 4-(2,4-DB) and 4-(MCPB) at 1/4, 1/2, and 1 lb/A; ethyl-N,N-di-n-propylthiolcarbamate (EPTC) at 1/2, 1, 2, 4 and 8 lb/A; and the amine salts of 2,4-D and MCPA at 1/4 and 1/2 lb/A. 2-4 true leaves, May 25: 4-(2,4-DB), 4-(MCPB) and EPTC at 1/2, 1, 2, 4 and 8 lb/A; sodium salt of 2,2-dichloropropionic acid (dalapon) and 1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea (neburon) at 1, 2 and 4 lb/A; mixtures of dalapon at 2 lb/A with each of the phenoxybutyric acids at 1/2, 1, 2 and 4 lb/A; 2,4-D and MCPA at 1/4 and 1/2 lb/A; and the alkanolamine salt of 4,6-dinitro-o-sec-butylphenol (DNBP) at 1, 2 and 3 lb/A. 6-8 true leaves, June 17: The same as May 25, except dalapon was used at 4 lb/A in the phenoxybutyric acid mixtures and neburon was omitted. Treatment stages of the summer seeding of alfalfa were the same as the spring seeding. The spraying dates were July 27, August 15 and August 28. EPTC was applied at 1 1/2, 3 and 6 lb/A instead of the previous rates. The mixtures of dalapon and the phenoxybutyric acids at 4 lb/A were omitted and the phenoxybutyric acids at 8 lb/A were omitted at the 6-8 true leaves stage. Pre-emergence application of EPTC gave excellent control of grasses and purslane, unsatisfactory control of lambsquarters and redroot pigweed at rates of 3 lb/A or above. EPTC did not harm alfalfa or birdsfoot trefoil. All other pre-emergence treatments were unsatisfactory. At the 2-4 true leaves stage good control of the mustard was obtained from all treatments except EPTC and dalapon. Post-emergence treatments of EPTC gave poor weed control. No treatment gave good control of ryegrass. Fair to excellent control of foxtail and millet was obtained from the dalapon-butyric mixtures. Dalapon at 2 lb/A and 4-(2,4-DB) at 1 lb/A was the most satisfactory mixture. In general, the phenoxybutyric acids gave good to excellent control of lambsquarters and redroot pigweed at the rate of 1 lb/A or above and showed some activity on grasses, especially preventing the development of roots. 4-(2,4-DB) was less injurious to alfalfa and birdsfoot trefoil than 4-(MCPB). DNBP gave poor millet control and good to excellent control of the broadleaf weeds with slight injury to alfalfa at 2 and 3 lb/A.

Red clover was underseeded in winter wheat on April 11. 4-(2,4-DB) and 4-(MCPB) at 1/2, 1, 2 and 4 lb/A and 2,4-D at 1 and 2 lb/A were applied at 2 preseeding dates, pre-emergence, and 3 post-emergence stages. Weeds were not serious in this experiment. Yield data indicated pre-emergence treatments were unsatisfactory. There was little difference between the phenoxybutyric acid treatments and check plot yield at the other treatment dates. 2,4-D reduced yield more than the phenoxybutyric acids. (Contribution of the Ohio Agricultural Experiment Station.)

Control of yellow rocket in established alfalfa. Dowler, Clyde, and Willard, C. J. Yellow rocket in the rosette stage in established alfalfa was sprayed March 22, 1957, with the amine salt of 2,4-D and the dimethylamine salt of gamma (2,4-dichlorophenoxy)-butyric acid [4-(2,4-DB)] at 1/2, 1 and 2 lb/A and in the early bud stage with the isopropyl ester of 2,4-D at 1/2, 1 and 2 lb/A and the butyl ester of 4-(2,4-DB) at 1, 2, 4 and 8 lb/A on April 16, 1957. Triplicate treatments were applied to 40 gpa of water. In the rosette stage yellow rocket was completely killed by 2,4-D amine at 1/2 lb/A, but the alfalfa was severely damaged; the 4-(2,4-DB) amine gave about 80 per cent kill and slight injury to alfalfa at 1 and 2 lb/A, while the 1/2 lb/A rate of 4-(2,4-DB) was ineffective. In the early bud stage 2,4-D ester at 1 and 2 lb/A gave satisfactory control of yellow rocket but killed 90 per cent or more of the alfalfa; the 4-(2,4-DB) ester at 4 and 8 lb/A gave good control with some alfalfa damage at 4 lb/A and severe damage at 8 lb/A. (Contribution of the Ohio Agricultural Experiment Station.)

Weed control in forage legumes the first year. Dunham, R. S., Robinson, R. G., and Jordan, L. S. Following harvest of oats or flax used as companion crops, mowing or spraying the stubble in 1956 were evaluated for establishment of alfalfa, sweet clover, and medium red clover in 1957. In 1956, weed control was better on mowed plots than unmowed, whether sprayed or not sprayed. Dalapon at 3 lb/A and TCA at 6 lb/A were essentially equivalent when used with 1/4 lb of 2,4-D amine, and moderately reduced Setaria spp. 2,4-D amine, at 1/4 lb/A only was used on red clover.

Results: TCA or dalapon seriously reduced the stand of alfalfa and sweet clover. Dalapon was somewhat less injurious than TCA. 2,4-D amine, alone at 1/4 lb/A did not reduce the stand of alfalfa or medium red clover. Mowing in 1956 was very injurious to sweet clover, moderately injurious to alfalfa, and slightly beneficial to red clover. (Contribution of the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 3846 Sci. Jour. Series, Minn. Agric. Exp. Station.)

Effect of herbicides on spring planted alfalfa. Elder, W. C. Alfalfa was planted April 15, 1957, in 1 ft rows on soil where a mixture of weeds and grasses had been broadcast. Plots were 4 rows, 20 ft long and all treatments were replicated 4 times. Herbicides were applied at 3 stages of alfalfa growth: stage 1, pre-emergence; stage 2, 1-2 true leaves; stage 3, 4 to 6 inches high. An abundance of rain fell throughout the spraying periods. Pre-emergence treatments, made immediately after planting, compared these herbicides: 3 lbs dalapon (2,2-dichloropropionic acid) per acre; 8 lbs TCA per acre; 8 lbs E.P.T.C. (ethyl N,N-di-N-propylthiocarbamate) per acre and 2 lbs 4-(2,4-DB) ester [4-(2,4-dichlorophenoxy)-butyric acid] per acre. Stages 2 and 3 were treated with dalapon and TCA at the same rate as in stage 1. E.P.T.C. and butyric acid were reduced to applications of 6 lbs, 1/2 lb and 1 lb per acre. Treatments of 2 lbs dalapon plus 1/2 lb 4-(2,4-DB) per acre, and 6 lbs TCA plus 1/2 lb 4-(2,4-DB) per acre were included in stages 2 and 3. In the pre-emergence test, 4-(2,4-DB) killed 95% of the alfalfa; TCA reduced alfalfa stand 75% and dalapon reduced the stand 25%. E.P.T.C. destroyed very little alfalfa and was more effective on the weeds and grasses than the other herbicides. In the second stage of growth, treatments of dalapon and TCA alone injured alfalfa to some extent but gave good grass control and fair control of weeds. One-half and 1 lb of 4-(2,4-DB) injured the alfalfa less than TCA and dalapon, and gave superior weed control but less grass control. The combination of TCA and dalapon with 4-(2,4-DB) acid produced good herbicidal results, but injured the alfalfa to some extent. E.P.T.C. was outstanding in this test, giving excellent weed and grass control and no visible injury to alfalfa. In the third stage of growth, E.P.T.C. was ineffective on the large weeds and grasses. The most effective results were received from mixtures of dalapon and TCA with 4-(2,4-DB). (Contribution of the Agronomy Department, Oklahoma Experiment Station, Stillwater, Oklahoma.)

Effect of MCP and 2,4-D seedling legumes, assessed the year following seeding. Friesen, H. A. In 1956, plots of Eagle oats under sown with bands of alfalfa, red and sweet clover, were sprayed with MCPB ester at 3, 6, 12 and 18 oz/A; MCPA ester at 3 oz/A; MCPA amine at 3 and 6 oz/A; MCPA potassium and sodium salts (mix) at 6 oz/A; 2,4-D ester and amine each at 3 oz/A. Spraying was done at two dates viz: (1) seedling stage and (2) first bud stage of hemp nettle Galeopsis tetrahit the major weed species. The plots carried a very heavy infestation of hemp nettle and a moderately heavy infestation of stinkweed Thlaspi arvensis. Due to early spring drouth in 1956 the large seeded nettle emerged about one week earlier than the legumes and at Date 1 formed a dense canopy over the emerging legumes. Comparisons were made with an untreated weedy check and a hand weeded check. Results: The MCPB and MCPA treatments at Date 1 resulted in excellent control of hemp nettle and stinkweed in 1956,

which in turn improved the yield of oats when compared with 2,4-DB and 2,4-D treated plots where hemp nettle was not controlled. At Date 2 none of the treatments resulted in good control of nettle. Each of the legume species on the MCPB and MCPA treated plots (Date 1) and the hand weeded check plots appeared to be more numerous and slightly larger and more vigorous than they were on the other treatments; assessed visually at the time the oats was harvested for grain and again before freeze-up in 1956. Plant counts taken in May, 1957, failed to establish significant differences between treatments. Generally all sprayed plots had a slightly higher number of plants than the unsprayed check plot, the hand weeded check in turn had a slightly larger number of plants of each legume species than the sprayed plots. Treatment at Date 1 was very slightly superior to spraying at Date 2. Yields (lb/A dry matter) of alfalfa and red clover followed the trends described for plant numbers. However, none of the differences were statistically significant. While the oats and weeds appeared to markedly retard the growth of the legumes in 1956, the removal of the weed competition alone did not significantly affect the yield of forage in the following year. (Contribution of the Experimental Farm, Lacombe, Alberta.)

Effect of MCP and 2,4-D sprayed on Oats undersown with Legumes.
(Spraying done 1956 - Legumes assessed 1957.)

Treatment No.	Treatment	Date	Plant Count per sq. yd. taken May, 1957			Yield lb/A Dry Wgt. 1957		Dry Wt. Weeds 1956	Yield of oats 1956
			Alfalfa	Red Clov.	Swt.Clov.	Alfalfa	Red Clov		
1	Check	-	72	82	114	2140	2568	1252	53.5
2	MCPB 3	1	114	130	139	2097	2418	259	74.3
3	MCPB 6	1	119	135	139	1755	3039	131	71.6
4	MCPB 12	1	88	124	113	2300	2824	39	74.4
5	MCPB 18	1	80	101	95	1830	2664	40	79.2
6	2,4-DB 3	1	101	131	143	1883	2803	928	60.6
7	2,4-DB 6	1	108	129	129	2268	2835	1004	58.9
8	MCP K & S 6	1	77	124	110	1883	2750	312	66.4
9	MCP A 3	1	84	112	127	2215	2760	675	57.1
10	MCP A 6	1	96	92	118	2300	2846	262	79.5
11	MCPE 3	1	92	123	150	2119	2696	450	69.9
12	2,4-D E 3	1	83	113	134	1873	2632	660	56.9
13	2,4-D A 3	1	69	106	106	1958	2728	983	61.0
14	MCP B 3	2	96	125	148	2076	2760	1022	58.8
15	MCPB 6	2	85	132	159	1701	2825	646	59.4
16	MCPB 12	2	92	134	144	2290	2696	619	59.3
17	MCPB 18	2	77	104	134	1723	2557	749	55.4
18	2,4-DB 3	2	102	109	99	1819	2568	1088	50.8
19	2,4-DB 6	2	104	130	125	1594	2589	824	47.0
20	MCP K & S 6	2	109	104	107	1840	2504	927	52.2
21	MCPA 3	2	79	95	139	1904	2493	1243	56.3
22	MCPA 6	2	109	101	126	1680	2343	974	62.3
23	MCPE 3	2	89	130	124	2097	2321	933	64.1
24	2,4-D A 3	2	85	112	105	1851	2589	1051	54.6
25	Hand weed	-	127	126	141	1840	2535	----	90.1
LSD P = .05						N.S.	N.S.		11.0

Comparison of 4-(2,4-DB) and 4-(MCPB) with various other herbicides for the control of annual weeds in seedling legumes. Friesen, H. A. On June 1, 1957, alfalfa, sweet clover, red clover and alsike clover were sown with a companion crop of oats. Alfalfa and sweet clover were also sown without the oats. The legumes and oats were sprayed with 4-(MCPB) butyl ester and sodium salt at 8, 16 and 32 oz/A; 4-(2,4-DB) butyl ester, amine and sodium salt at 8, 16 and 32 oz/A; MCPA amine at 4 and 6 oz/A; 2,4-D amine at 3 oz/A; MCPA amine/4-(2,4-DB) mixed 16:1; and MCPA ester/4-(MCPB) ester mixed 16:1 when the alfalfa was in the 2-leaf stage. When the alfalfa reached the 5-leaf stage 4-(2,4-DB) amine and 4-(MCPB) sodium salt at 16 oz/A and MCPA amine at 4 oz/A were applied to further plots of legumes and oats. EPTC at 5 lb/A and Neburon at 4 lb/A were applied prior to emergence of the oats. Effectiveness was assessed by plant counts and dry weights of weeds and legumes seeded without companion crop. The oats were harvested for grain but the undersown legumes were too much suppressed by the oats to merit sampling. Results: Legumes seeded without companion crop. During the early growth stages plots treated with 4-(2,4-DB) ester, amine and sodium salt were outstanding in number and vigor of alfalfa plants. Weed control with 4-(2,4-DB), 4-(MCPB) and MCPA was satisfactory, although 4-(2,4-DB) enjoyed a distinct advantage at the 8 and 16 oz/A rate. Generally, the 4-(2,4-DB) and 4-(MCPB) formulations, notably the esters, were effective against weeds such as stinkweed, ball mustard, lambs-quarters and wormseed mustard. 4-(MCPB) was also effective on hemp nettle. 2,4-D amine at 3 oz/A gave poor weed control. Plant counts and dry weights indicated that the 4-(MCPB) ester and sodium salt at 32 oz/A reduced the alfalfa stand and yield significantly. Similar results were noted following the use of MCPA amine at 6 oz/A; the 2,4-D amine at 3 oz/A and the MCPA/4-(MCPB) mixture at 16 oz/A. With the exception of the treatments named above, which depressed the yield of alfalfa, each formulation applied at the 2-leaf stage increased the yield by 300-500 lbs/A. At the 5-leaf stage only 4-(MCPB) at 16 oz/A increased the alfalfa yield. EPTC resulted in fair weed control, except Lambs-quarters, and increased the alfalfa yield. Neburon resulted in essentially no weed control (possibly due to lack of substantial rains), which resulted in lowered yields of alfalfa.

The stand and vigor of the sweet clover was greatly reduced by weevils. While this tended to permit a ranker growth of weeds, weed control followed a pattern closely similar to that described for alfalfa. Sweet clover yields were greatly improved as a result of the weed control by all phenoxy-type formulations except the 4-(2,4-DB) ester and 4-(MCPB) ester. The 32 oz/A dosage of these formulations virtually eliminated the clover; EPTC and Neburon had similar effects on sweet clover as they had on alfalfa.

Eagle oats undersown with the four legumes was in the 2-3 leaf stage at time of spraying the alfalfa in the 2-leaf stage. The ester forms of 4-(2,4-DB) and 4-(MCPB) at 32 oz/A significantly reduced the yield, while the other treatments resulted in some increase in oat yields. (Contribution of the Experimental Farm, Lacombe, Alberta.)

Comparison of 4-(2,4-DB) with 4-(MCPB) and various other herbicides for the control of annual weeds in alfalfa and sweet clover. Seeded without a companion crop. Lacombe, 1957.

	Treatment	Rate	Plant Count per sq. yd.		Dry Wts. Lb/A		Plant Count Sweet		Dry Wts. Sweet		Yield of oats
			Alf.	Weeds	Alf.	Weeds	Clover	Weeds	Clover	Weeds	Bu/A
1.	EPTC	5#	178	6	2150*	396	44	17	353	1070	94.7
2.	Neburon	4#	166	37	1605	1284	42	25	300	2226	106.7
3.	4-(2,4-DB) amine	8	195	19	2493*	310	40	28	492	1091	96.0
4.	"	16	188	14	2183*	588	35	28	289	1188	95.2
5.	"	32	310	8	2236*	64	28	32	214	439	89.0
6.	4-(2,4-DB) Sod. Salt	8	198	10	2290*	160	37	53	246	1338	87.4
7.	"	16	186	17	2258*	278	30	30	407	1091	91.8
8.	4-(2,4-DB) But. Est.	8	166	8	1712	107	35	25	193	535	95.8
9.	"	16	194	6	2012*	160	31	30	300	728	84.2
10.	"	32	189	2	2108*	160	14	14	21	813	75.4*
11.	4-(MCPB) Sod. Salt	8	170	11	2172*	214	33	39	289	1626	99.4
12.	"	16	175	7	2397*	214	24	34	214	1466	95.2
13.	"	32	155	8	1584=	86	37	19	257	610	104.8
14.	4-(MCPB) But. Est.	8	164	14	2129*	246	28	38	171	1081	103.7
15.	"	16	157	10	2119*	96	29	16	86	268	95.2
16.	"	32	142	6	1434=	86	25	15	64	385	78.2*
17.	2,4-D amine	3	176	30	1519=	910	38	27	235	1584	87.7
18.	MCPA amine	4	222	8	1862	193	47	38	460	1263	95.0
19.	"	6	183	12	1573=	235	36	19	310	920	88.9
20.	MCPA/ 4-(2,4-DB)	16	204	19	1798	374	34	31	193	931	98.0
21.	MCPA/ 4-(MCPB)	16	169	14	1412=	64	35	51	342	1134	96.8
22.	4-(2,4-DB) amine	16	206	19	1712	578	38	42	107	974	93.9
23.	4-(MCPB) Sod. Salt	16	212	8	2215*	96	35	48	107	1573	90.9
24.	Check	--	173	53	1723	984	31	41	96	2547	90.9
25.	MCPA	4	195	17	1755	193	37	40	203	867	102.0
LSD P = 5					207						

Response of five varieties of alfalfa to 4-(2,4-DB) and dalapon. McCarty, M. K., and Sand, P. F. Five varieties of alfalfa (Buffalo, Grimm, Ladak, Ranger and Vernal) were planted on April 16, 1957. Treatments with nominal and high rates of 4-(2,4-DB) and dalapon and mixtures of the two were applied on June 4 in four replications. The amine salt of 4-(2,4-DB) was used at 1 and 4 lb rates and dalapon at 2 and 8 lb rates. Mixtures consisted of 1, 2, and 4 lb of 4-(2,4-DB) and 2, 4 and 8 lb of dalapon respectively. The alfalfa was 3 to 5 inches tall and the weeds 3 to 6 inches tall. Kochia and pigweed were main broadleaved weeds with green and yellow foxtails as the main weedy grasses.

Treatment	Rate lb/A	Alfalfa		Weedy grasses		Forbs	
		Count	Yield	Count	Yield	Count	Yield
4-(2,4-DB)	1	222	122	643	3650	11**	56**
4-(2,4-DB)	4	190	167	615	4059	2**	10**
Dalapon	2	304	328	391**	1102**	38	1541
Dalapon	8	415*	383*	339**	47**	31	1015
Mixture A (1)	1 & 2	374*	643**	342**	437**	22	82**
Mixture B	2 & 4	320	607**	416**	256**	18	57**
Mixture C	4 & 8	328	534**	368**	118**	17*	229**
Check		218	226	611	3178	28	1108

(1) Mixture A - 1 lb 4-(2,4-DB) and 2 lb dalapon.
Mixture B - 2 lb 4-(2,4-DB) and 4 lb dalapon.
Mixture C - 4 lb 4-(2,4-DB) and 8 lb dalapon.

* Difference from check exceeds 5% level of significance.
** Difference from check exceeds 1% level of significance.

There was no indication of differential reaction among the varieties to either chemical. The broadleaved weed population was only moderate and somewhat variable. However, all treatments containing 4-(2,4-DB) gave excellent control of the broadleaved weeds. All treatments containing dalapon gave good to excellent control of the weedy grasses. The only treatments where there was a significant increase in alfalfa stand and/or yield involved the higher rate of dalapon or the mixtures of the two chemicals. There was some injury to the alfalfa with the 4 lb rate of 4-(2,4-DB) and with the 8 lb rate of dalapon. However, the mixture containing 4 lb 4-(2,4-DB) and 8 lb of dalapon gave little injury to the alfalfa and the regrowth was clean and showed no residual effect. (Contribution of the Crops Research Division, ARS, U.S.D.A. and the Nebraska Agricultural Experiment Station cooperating.)

Effect of substituted phenoxyacetic and butyric acids on seedling alfalfa and broadleaved weeds. McCarty, M. K. and Sand, P. F. Ranger alfalfa was seeded on April 17, 1957. Treatments were replicated four times. Initial germination was spotty due to poor soil moisture, so the area was sprinkler irrigated May 8. At treatment time, June 5, alfalfa varied from 3 to 6 inches tall and weeds from 1 to 8 inches tall. The main weeds were kochia, pigweed, and smartweed with widely scattered plants of velvet leaf and lamb's quarters. Evaluation of the treatments was made by counting the number of alfalfa and broadleaved weed stems in five 2x4 ft quadrats per plot about 4 weeks after treatment. Quadrats were clipped at the bud stage of the alfalfa, and the plant material separated into three parts; alfalfa, weedy grasses and broadleaved weeds.

Treatment	Rate lb/A	Alfalfa Count (1)	Alfalfa Yield (2)	Broadleaved weeds Count	Broadleaved weeds Yield
4-(2,4-DB) Amine	1/2	649	696	29**	939**
4-(2,4-DB) Amine	1	672	1416**	20**	423**
4-(2,4-DB) Ester	1/2	714	1407**	9**	351**
4-(2,4-DB) Ester	1	541	1095**	5**	117**
4-(MCPB) Ester	1/2	548	396	45*	2757
4-(MCPB) Ester	1	508	609	42*	600**
2,4-D Amine	1/2	486	705	38**	966**
2,4-D Amine	1	341*	360	24**	573**
Check		574	342	68	4188

* Difference from check exceeds 5% level of significance.
** Difference from check exceeds 1% level of significance.

The alfalfa stand appeared to be slightly better than the check when treated with 4-(2,4-DB) but less than check when treated with 4-(MCPB) and 2,4-D. Only the stand of alfalfa in the treatment of the 1 lb rate of 2,4-D was significantly less than check. There was considerable variability in alfalfa production with much of the benefit of broadleaved weed control being offset by the increased growth of weedy grasses. There was a significant reduction of broadleaved weeds under all treatments with 4-(2,4-DB) ester plots showing the best results both from count and yield basis. (Contribution of the Crops Research Division, ARS, U.S.D.A. and the Nebraska Agricultural Experiment Station cooperating.)

Phenoxybutyric acid compounds on seedling alfalfa. Nash, Russel L. Quadruplicate plots of Ranger alfalfa were seeded on June 22. Treatments were made July 16 when the alfalfa and weeds were 4 to 6 inches high. Predominant weeds were kochia, pigweed, and Setaria spp. Chemical treatments were 4-(2,4-DB) and 4-(MCPB) expressed as the diethylamine, 4-(2,4-DB) as the butoxy ethoxy propanol ester, 4-(2,4-DB) as the polypropylene glycol butyl ether ester, and 4-(2,4-DB) as the mixed ester. All were applied at 1 and 2 lb/A. In addition to the butyrics, all plots, including the check, received a blanket application of Dalapon at 2 lb/A. One-half of each plot was sprayed with the sodium salt of dalapon and one-half with an ester of dalapon.

Observation revealed no difference between the two formulations of dalapon as affecting the alfalfa and all grasses were completely killed in either case.

Due to the late planting and hot weather, there was not enough growth for yield determinations; therefore, stand counts were made instead.

The following table gives the stand count per square yard of alfalfa and the stand count of broad-leaf weeds per square rod.

Treatment	Rate lb/A	Alfalfa count/sq. yd. Ave. of 4 reps	Weed count/sq. rd. Ave. of 4 reps
4-(2,4-DB) mixed ester	1	258.0	2.5
4-(2,4-DB) mixed ester	2	236.0	.5
4-(2,4-DB) BEP ester	1	276.7	12.2
4-(2,4-DB) BEP ester	2	259.7	.7
4-(2,4-DB) PGBE ester	1	251.0	6.7
4-(2,4-DB) PGBE ester	2	260.7	0
4-(2,4-DB) amine	1	260.7	47.2
4-(2,4-DB) amine	2	268.0	4.0
4-(MCPB) amine	1	262.0	41.2
4-(MCPB) amine	2	250.2	7.5
Check	-	145.2	1049.2

L.S.D. for alfalfa counts 38.92
L.S.D. for weed counts 76.704

This data indicates that the ester formulations are equal to each other in performance and at the lower rate are more effective than either of the amine formulations, although not significantly so. The higher rate in all cases tended to give better weed control, although only slight with the ester formulations. (Contribution of the University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

Effect of herbicides on weed control and establishment of alfalfa, medium red clover, sweet clover, alsike clover, and birdsfoot trefoil sown alone and with flax. Robinson, R. G., and Dunham, R. S. Pre-emergence applications of CDAA at 4 lb; EPTC at 5 lb; or simazin at 3 lb/A were made 4 days after sowing the flax and legumes. A post-emergence application of MCPA at 1/4 lb/A was made one month after sowing to plots sprayed with CDAA and EPTC. Results: Simazin killed weeds and all legumes except birdsfoot trefoil which survived although badly hurt. Neither CDAA nor EPTC gave satisfactory weed control nor did they injure the legumes.

Post-emergence applications of TCA at 5 lb and dalapon at 1/2, 2/3, or 1 lb/A were made a month after sowing. These plots and a check were sprayed with MCPA at 1/4 lb/A for non-grass weed control. Results: Dalapon at 1/2 or 2/3 lb/A failed to control giant foxtail adequately when the legumes were sown alone. At 1 lb, dalapon gave excellent control. TCA gave better control than 2/3 lb of dalapon but not as good as 1 lb in legumes sown alone. TCA injured alfalfa, red clover, and alsike clover but alfalfa and red clover made satisfactory stands. All legumes sprayed with dalapon made satisfactory stands except sweet clover sown alone which failed to establish under any treatment.

Post-emergence applications of 4-(2,4-DB) amine, 4-(2,4-DB) ester, or 4-(MCPB) amine at 1/2 lb/A or MCPA at 1/4 lb/A were made a month after sowing. These plots were sprayed with dalapon at 1 lb/A for grass weed control. Results: 4-(2,4-DB) gave outstanding control of smartweed; the ester being the better formulation. None of the legumes was injured by any treatment.

Where control was not adequate, legume establishment was adversely affected by weed competition. The only treatments that gave good weed control and good establishment of legumes sown alone were: dalapon 1 lb + 4-(2,4-DB) 1/2 lb, amine or ester. (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn., Paper No. 3847 Sci. Jour. Series, Minn. Agric. Exp. Station.)

Chemical Weed Control in Seedling Alfalfa. Slife, F. W., and Gantz, R. L. Ranger alfalfa was seeded on May 9, 1956, without a nurse crop. When the alfalfa was 2 inches tall 2,4-DB ester at the rates of 1/2, 1 and 2 lbs per acre and Dowpon at 1, 2 and 3 lbs per acre were applied to individual plots in 20 gallons of water per acre. In addition the two chemicals were applied together in all possible combinations of the above rates. The same chemicals and chemical combinations were applied to new plots when the alfalfa was 5 inches tall. Exceptionally good broad-leaf weed control was obtained with 2,4-DB at 1 and 2 lbs per acre at both application dates. Dowpon gave good grass control at 2 and 3 lbs at the 1st application date and good grass control at 3 lbs at the last application date. Although Dowpon did not give broad-leaf weed control, it did retard the broad-leaf weeds to the point that they were no problem. The most effective treatment was 1/2 lb 2,4-DB plus 2 lbs Dowpon. Heavier rates of the combination caused leaf burning of the alfalfa and retarded its growth. Treatments when the alfalfa was 5 inches tall were less effective than those applied earlier because of the more advanced growth of the weeds. Dowpon at 3 lbs alone was almost comparable to 2,4-DB at 1/2 plus Dowpon at 2. (Contribution of the Ill. Agr. Experiment Station.)

Herbaceous Weeds in Pastures and Meadows

M. K. McCarty

Summary

Three abstracts were received, one on grass seed production and the others on control of ironweed and yucca respectively. Bromegrass showed seed yield reductions when sprayed with 2,4-D amine at rates above 24 oz per acre. In crested wheatgrass, the Fairway strain showed seed yield reductions above 21 oz per acre while the Standard strain showed no reduction at rates up to 2 1/2 lb per acre.

Two years treatments with various rates and formulations of 2,4-D gave reductions of ironweed varying from 52 per cent for 2 lb amine salt to 98 per cent with the 1 lb rate of isopropyl ester in a 1:4 oil-water emulsion. A butoxyethanol ester with translocator additives gave reductions of 92 to 97 per cent at both 1 and 2 lb rates. Several herbicides applied to yucca showed moderate or no effectiveness except for 2,4,5-TP. Results were excellent at both 2 and 4 lb per acre rates with no resprouting except one plot at the 2 lb rate.

Abstracts

Effect of 2,4-D on Seed Production of bromegrass and crested wheatgrass. Knowles, R. P., and Selleck, G. W. A variable rate sprayer was used to apply 2,4-D amine to a one-year old stand of bromegrass and three-year old stands of Fairway and Standard type Crested Wheatgrasses. Duplicate strips were sprayed in bromegrass and single strips in the two wheatgrasses. Seed yields were generally low because of drought.

In bromegrass reductions in seed yields were noted at rates above 24 oz acid equivalent when applied May 22, June 4, June 17, and July 3. Damage appeared less severe for the June 17 treatment which date was midway between meiosis (June 4) and flowering (July 3).

In Fairway Crested Wheatgrass seed yields were reduced by treatments of over 21 oz per acre on May 22 and treatments of over 40 oz on June 4 and June 17. The Standard type of Crested Wheatgrass was sprayed June 17 and July 3 (flowering) and showed no reductions in seed yields when applied at rates up to 40 oz at either date.

Effects on forage production appeared less marked than effects on seed production. (Contribution of the Canada Agriculture Research Service, Forage Crops Laboratory and Department of Plant Ecology, University of Saskatchewan cooperating.)

Effect of several formulations of 2,4-D on ironweed (Vernonia baldwini). McCarty, M. K., and Linscott, D. L. Plots 30x100 ft in 3 replications were sprayed near mid-June of 1955 and 1956 with 1 and 2 lb rates of various formulations of 2,4-D for control of ironweed. The spray was applied with a tractor sprayer at 16 gpa. The amine salt, isopropyl ester and butoxyethanol ester of 2,4-D (with and without additives) were used. As one of the additive formulations was oil soluble, a 1:4 oil-water emulsion was used to bring it to 16 gpa. A similar treatment using 1 lb/A of isopropyl ester was also applied in the 1:4 oil-water emulsion.

Stem counts were made in ten 2x4 ft quadrats per plot in 1955 prior to treatment. The counts made in June, 1957, represent the cumulative effect of two years' treatment. The 2 lb/A rate of amine salt gave 52 per cent reduction of ironweed stand, 1 and 2 lb/A of isopropyl ester 71 and 88 per cent reduction respectively and 1 lb/A of butoxyethanol ester 85 per cent reduction. The 2 lb/A rate of butoxyethanol

ester and the 1 and 2 lb/A rates of this ester with the additives gave reductions ranging from 92 to 97 per cent with the 1 lb/A rate of isopropyl ester in the oil-water emulsion a reduction of 98 per cent. Over this same period stem numbers in the check plots increased 89 per cent.

Although there were no treatments applied in 1957, observations in August disclosed nearly complete absence of annual weeds, particularly annual ragweed where control had been good in 1955 and 1956. (Contribution of the Crops Research Division, ARS, U.S.D.A. and the Nebraska Agricultural Experiment Station cooperating.)

Response of yucca (Yucca glauca) to treatment with herbicidal sprays and granules. Shafer, N. E. Duplicate square rod plots were treated May 24, using 2,4-DP amine at 1, 2, and 4 lb/A; 2,4,5-TP ester at 2 and 4 lb/A in water and 4 lb in oil; and 25% polychlorobenzoic acid granules (M-323-A) 24-48 mesh, at 1/4 and 1/2 lb of product per square rod. Further treatments were prevented at this time by a light continuing rain. Soil moisture was good. No flower stalks were yet visible on any yucca plants. The following treatments were applied June 5: polychlorobenzoic acid (Benzac) 2 and 4 lb/A; MCPP 1, 2, and 4 lb/A and 4 lb/A in a 5:15 oil-water emulsion. At this time flowering stalks varied in size from just emerging up to 2.5 feet in length. Soil moisture was still good. Results: on October 16, the following results were apparent: 2,4-DP amine was not effective at any rate of application; 2,4,5-TP at 2 and 4 lb in water or 4 lb in oil gave 100% top kill with no resprouting except one plant at the 2 lb rate; benzoic acid granules at 1/4 and 1/2 lb resulted in 25 to 50% leaf kill but no plants appeared dead; Benzac spray at 2 and 4 lb/A gave 15 and 30% plant kill; MCPP was not effective at any rate of application and results were not improved with the oil-water emulsion treatment. (Contribution of the Agronomy Department, University of Nebraska, Lincoln, Nebraska.)

SUGAR BEETS

E.A.Helgeson

Summary

Only two abstracts were received this year. Several additional abstracts reported work on weed control in a number of crops with sugar beets as one of these crops. These abstracts were entered by R.S.Dunham under the section on annual grass weeds.

Abstracts

Effect of several pre-emergence treatments on stands of sugar beets and weeds. Nash, Russel L. A preliminary study on the possibility of reducing weeding costs of sugar beets was conducted at the North Platte Experiment Station in 1957. In this study there was no cultivation, blocking, or thinning, with the intention being to take the most promising chemicals for a more detailed study in 1958. Sugar beets were planted on June 6, 1957, in 22-inch rows wide and 39 feet long. The soil ranged from a Lamoure sandy loam to a Hall very fine sandy loam. Following treatment, .25 inches of rain fell on the 13th, .37 on the 14th, .30 on the 15th, and .48 on the 16th. A half inch was recorded in small amounts the remainder of the month. The following chemicals were applied as the active ingredient at the rates shown in the table: Disodium 3,6-endoxohexahydrophthalate (endothal); sodium trichloroacetate (TCA); 2-chloro-N,N-diallylacetamide (CDAA); 2-chloro-N,N-diethyl acetamide (CDEA); dichloral urea (DCU); isopropyl-N-(3-chlorophenyl) carbamate (CIPC); ethyl N,N-di-n-propylthiol-carbamate (EPTC); orthonitrochlorobenzene (ONCB); pentachloronitrobenzene (Terraclor); 2-chloro-4,6-bis (ethylamino)-s-triazine (Simazin); G-27901 (Simazin related); G-30028 (Propazin); G-30044 (Simazin related) and G-30451 (Simazin related). The annual grasses present were mostly Setaria spp., Echinochloa crusgalli, and Eragrostis cilianensis. Broadleaved weeds were Amaranthus retroflexus and tribulus terrestris. The figures below are the average of 3 replications one mo. after treatment.

		Percentage reduction in stand based on check		
Chemical	Rate/acre	Grassy Weeds	Broad-leaved Weeds	Sugar Beets
Endothal	6 lbs.	92.7	69.3	3.3
Endothal	8 lbs.	96.0	89.0	3.0
Granular Endothal	6 lbs.	93.3	97.0	.66
TCA	6 lbs.	96.3	45.0	2.3
TCA	8 lbs.	94.3	35.0	1.0
CDAA	6 lbs.	98.7	51.7	24.3
CDEA	6 lbs.	95.3	58.3	28.3
DCU	10 lbs.	98.7	76.7	7.7
CIPC	8 lbs.	99.3	99.0	100.0
EPTC	6 lbs.	99.3	98.7	3.3
ONCB	2 lbs.	3.3	3.3	2.7
Terraclor	60 lbs.	35.0	93.0	47.3
Simazin	2 lbs.	99.0	100.0	100.0
G-30044	2 lbs.	71.7	73.3	100.0
G-30028	2 lbs.	78.3	100.0	100.0
G-27901	2 lbs.	73.3	98.0	100.0
G-30451	2 lbs.	75.0	98.0	100.0

(Contribution from the University of Nebraska Experiment Station, North Platte, Nebraska, and Nebraska Department of Agriculture and Inspection, Division of Noxious Weeds, Lincoln, Nebraska.)

Post-emergence application of 2,2-dichloropropionic acid (Dalapon) at Halstad, Minnesota to control wild oats and setaria in sugar beets. Zinter, C.C.; Amstrup, C.R.; Slough, A.T. Application of 7 1/2 lb. product/A (2,2-dichloropropionic acid, sodium salt 85%) in 10 gal. of water June 19, 1957. Beets were 1-3 in. high. Wild oats and setaria were effectively controlled. There was no visible beet injury. Rains were excessive during June and July; wild oat population was too low to get accurate measurement of control. No yield tests were taken. (Contribution of F. H.Peavey & Co., Minneapolis, Minnesota.)

TURF

Summary

Oliver C. Lee

Results from application of some fourteen different herbicidal materials for weed control in turf are reported in the following six abstracts. Most of them were applied for crabgrass control. One abstract deals with the use of Neburon for chickweed control and one with 2,4-D for control of various broadleaf species in crested wheat grass seedlings.

Apparently several of the herbicides tried gave some degree of control of crabgrass. Results of heavy application of lead arsenate and chlordane are most promising. Other materials include DSMA, KOCN, and PMA. Dalapon, though effective in killing crabgrass, is too toxic to turf grasses.

Abstracts

Control of crabgrass in bluegrass turf. Davis, R. R. An unirrigated bluegrass sod mowed 1½ to 2 inches high was used as the test area. There was a mixed population of Digitaria sanguinalis and D. ischaemum. Treatments were applied as an aqueous spray at the rate of 2.3 gal./1000 sq. ft. The degree of control was estimated by sampling five - 1 sq. ft. areas on each plot of 4 replications. The early post emergence treatments were started June 12, and the late treatments started July 25.

Percent crabgrass and percent bare ground Oct. 4, 1957.

		Early Post Emergence			Late Post Emergence		
Chemical	Oz./1000 sq. ft.	Applications	% crabgrass	% bare	Applications	% crabgrass	% bare
DSMA	2.0	3-1 wk.	14	2	3-1 wk.	2	21
DSMA	3.0	3-1 wk.	23	3	3-1 wk.	4	32
PMA	0.2	3-1 wk.	23	1	4-1 wk.	28	10
Trichloriso-butyric acid	1.5	3-1 wk.	14	1	4-1 wk.	16	9
KOCN	2.9	--	--	-	4-1 wk.	42	11
Check	-	--	57	1	--	66	1
LSD .05			26	N.S.		37	11
.01			36	N.S.		50	16

There was some injury to bluegrass with DSMA in the late post emergence test. There was no injury other than discoloration in the early test. While there was less crabgrass at the end of the season on the best late treatments the turf treated early had a better appearance throughout the season. Trichloriso-butyric acid showed promise for controlling crabgrass with both early and late treatments.

A pre-emergence test on an area with an erratic crabgrass stand gave no significant control of crabgrass. Materials used were lead arsenate, Pax, NPA CDAA and CDEC. (Contribution of Ohio Agricultural Experiment Station).

Chickweed (Stellaria media) Control with BDMU (Neburon) 3-(3,4-dichlorophenyl) -1 methyl-1n-butylurea. Friesen, H. A. Neburon was tested as a selective control

measure for chickweed in three crops, viz: (1) Kentucky bluegrass lawn; (2) dahlias and iris and (3) strawberries. The treatments were applied in August on chickweed well advanced in growth. Trial 1 - Neburon was applied at 2.1 and 3.2 lb/A in 25, 50, 100 and 200 gals/A of water. Each of the treatments resulted in complete kills of the chickweed without visible injury to the bluegrass. Some three weeks elapsed before the kills were complete - this may have been due to the very limited rainfall in August. Trial II - Neburon applied in a flower border of dahlias and iris infested with chickweed resulted in complete kills of the weed. Further emergence of chickweed began some five weeks after treatment. The dahlias and iris showed no evidence of damage which may be due to the precautions taken to avoid direct spraying of the plants. Trial III - Neburon at 2 lb/A in 200 gals./A of water was applied as an overall spray to chickweed in strawberries and at the bases of raspberry plants. Weed kills were complete, both strawberries and raspberries appeared uninjured and continued to fruit. (Contributed by the Experimental Farm, Lacombe, Alberta).

Chemical evaluation for late summer control of crabgrass and effect on U-3 Bermuda sod. Huffine, Wayne W. and Elder, W. C. A comparison of six commercially available chemicals for late summer control of crabgrass (Digitaria sanguinalis) and their effect on U-3 bermuda (Cynodon dactylon var. U-3) was made in replicated, randomized plots each 100 square feet in size. Treatments were applied July 29 and August 5, 1957. Materials tested were disodium methyl arsonate (DSMA) 4 and 8 lbs./A; potassium cyanate (KOCN) 8 and 12 lbs./A; 1-n-butyl-3-(3,4-dichlorophenyl)-1-methylurea (Neburon) 2 and 4 lbs./A; 2,2-dichloropropionic acid (Dalapon) 3 and 6 lbs./A; phenyl mercuric acetate (PMAS) 8 and 12 pts./A; and ammonium nitrate (NH_4NO_3) 174 and 261 lbs. N/A.

		Crabgrass Control/1			Injury to U-3 Bermuda/2		
Material	Rate/A per Trt.	1 week after 1st Trt. Aug. 5	1 week after 2nd Trt. Aug. 12	1 month after 2nd Trt. Sept. 5	1 week after 1st Trt. Aug. 5	1 week after 2nd Trt. Aug. 12	1 month after 2nd Trt. Sept. 5
DSMA	4 lbs.	1-3	4-6	7-9	0	0	0
DSMA	8 lbs.	4-6	7-9	10	1-3	1-3	0
KOCN	8 lbs.	1-3	0	0	1-3	7-9	0
KOCN	12 lbs.	1-3	0	0	1-3	7-9	0
Neburon	2 lbs.	1-3	1-3	1-3	1-3	0	0
Neburon	4 lbs.	1-3	1-3	0	1-3	0	0
Dalapon/3	3 lbs.	0	4-6	10	1-3	7-9	10
Dalapon	6 lbs.	1-3	7-9	10	---	---	--
PMAS	8 pts.	1-3	1-3	0	1-3	0	0
PMAS	12 pts.	1-3	1-3	1-3	1-3	0	0
NH_4NO_3	174 lbs. N	7-9	7-9	7-9	7-9	7-9	0
NH_4NO_3	261 lbs. N	7-9	7-9	7-9	7-9	7-9	0

/1 Crabgrass Control

0	No crabgrass control
1-3	Poor control
4-6	Poor to fair control
7-9	Good to excellent control
10	Perfect control

/2 Injury to U-3 Bermuda

0	No apparent injury
1-3	Slight injury
4-6	Moderate injury
7-9	Severe injury
10	All plants killed

/3 Dalapon apparently killed the U-3 Bermuda in addition to the crabgrass.

(Contribution of Department of Agronomy, Oklahoma State University, Agricultural Experiment Station).

Pre-emergence treatment of fairways for crabgrass control. Rogers, J. Egley, G., Ingle, M. Two fairways of the Purdue Golf Course were treated with chemicals for crabgrass control on April 16, 1957. The fairways are predominantly bluegrass sod; although the fairways are not irrigated, the area was well-watered due to higher-than-normal rainfall in the spring and early summer. Plots were run in duplicate and were 6' x 100'. Crabgrass seed was just beginning to germinate. A visual estimate of crabgrass control was made July 26:

Herbicide	Rate (active)	% Control (Aver.)
Neburon	4 lbs/A	8
	6	4
Lead Arsenate	550	70
NPA-1F	6.75	27
	11.25	45
Chlordane		
5% dust	75	93
	100	93
5% gran.	75	93
	100	75
75% emuls.	75	71
	100	86

No injury to bluegrass resulted from any treatment. (Dept. of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana).

The effect of herbicides on forbs in lawn grass. Selleck, G. W. Concentrated Borascu (61.5% B_2O_3) at rates of 64 and 128 lb/A, D.B. granular (43.2% B_2O_3, 7% 2,4-D) at 57 and 114 lb/A and the dimethyl amine of 2,4-D at 1 and 2 lb/A were applied October 26, 1956 to lawn grass in 16 x 100 ft. plots. The weeds present included peppergrass, dandelion, common plantain and round-leaved mallow. On May 9, 1957, forbs were absent in plots treated with 2,4-D and with D.B. granular at 114 lb/A. Dandelions appeared sickly where D.B. was applied at 57 lb/A. Dandelions and peppergrass appeared vigorous in plots treated with C.B. On June 6, dandelion control had deteriorated to 80% in the 2,4-D treatments and where D.B. was applied at 114 lb/A. The C.B. treatments provided 40% control of dandelion. Granular materials damaged lawn grass 20% to 50% in May, 1957. The grass had recovered completely in the D.B. treatments by June and in the C.B. treatments by August. (Contribution from the Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from the Sask. Agric. Research Foundation).

The effect of 2,4-D amine on weeds in crested wheat grass seedlings, 1957. Selleck, G. W., J. F. Alex and R. P. Knowles. The dimethyl amine salt of 2,4-D at an initial rate of 2.5 lb/A was applied to weeds in crested wheat grass seedlings on May 22 and June 3 and at a rate of 5 lb/A on June 17. The herbicide was applied to duplicated plots 15 x 135 ft. with a logarithmic sprayer which delivered 34 gal/A. The rate of application of herbicide was reduced by one-half every 21 ft. On May 22 the crested wheat grass was 2.5 in. high, sweet clover was in the first true-leaf stage and weeds in the rosette stage. On June 3, the grass was 5 in. high, the sweet clover was producing its second trifoliate leaf and other weeds were in various stages from 3 in. high to the early blossom stage. On June 17, the crested wheat grass was 7 in. high and in the 4-leaf stage. Sweet clover had produced 3 to 4 leaflets and many of the other weeds were in the mid- to late-flowering stages. At rates between 40 and 13 oz/A applied at the first date of treatment, the leaves of crested wheat grass appeared slightly narrower and brown at the tips. No effects were visible at lighter rates. Heading was delayed

and some produced abnormal heads. At the second date of treatment no damage was visible to crested wheat grass. The plants averaged 1 in. taller in the weed-infested check plots, however, possibly due to shading by weeds. No detrimental effects were visible to crested wheat grass seedlings which were treated at a 5 lb/A rate in the 4-leaf stage. The majority of the weeds were more susceptible to the 2,4-D at early stages of development. The exceptions were sweet clover and Russian thistle. The following table indicates the amounts of 2,4-D amine (oz/A) required for various degrees of control of certain weeds on the date of treatment which was most effective. Control is based on visual estimates where 6 = satisfactory control and 10 = complete kill.

Weed	Treatment date	Degree of control		
		7	8	10
Sweet clover	June 3	17	19	33
Stinkweed	May 22	--	--	8
Flixweed	" "	--	14	22
Lamb's quarters	" "	--	10	14
Kochia*	June 17	--	25	--
Wild buckwheat	May 22	7	--	--
Russian thistle	June 17	--	6	8

* Present only in plots which were sprayed June 17, 1957.

The dimethyl amine salt of 2,4-D was applied at a rate of 2 lb/A on June 3 to a dense stand of sweet clover in two, 0.25 acre plots. Crested wheat grass was 6 in. high in the 4-leaf stage in one plot and 2 in. high in the 2-leaf stage in the other. Sweet clover was in the second true-leaf stage on both plots. Sweet clover was 90% controlled. A slight browning of leaf-tips was visible on crested wheat grass which was treated in the 2-leaf stage. (Contribution from the Dept. of Plant Ecology and Dominion Forage Crops Lab., Univ. of Sask., Saskatoon, with financial assistance from United Grain Growers Ltd.).

Field and Canning Peas

Summary — J.J. Hexamith

Field peas

Post-emergence. On a weed free basis at Portage la Prairie, Manitoba, TCA at 3 lb/A caused a yield reduction of 10%; the addition of sodium or potassium salts of MCPA at 4 oz/A did not alter the effects of TCA.

Canning peas

Pre-seeding. At Lethbridge, Alberta, out of a number of pre-seeding treatments for grass weed control, only EPTC at 4 lb., CIPC at 6 lb, and 1,2,4,5-TCB (M-757) at 15 lb/A gave over 80% control of wild oats, and only EPTC at 4 lb. gave over 80% control of green foxtail while causing only slight injury to peas.

Pre-emergence. At Madison, Wisconsin, it was concluded that "dalapon at 2 lb/A, TCA at 6 lb/A, CDAA at 4 lb/A, EPTC at 4 lb/A, and DNBP at 8 lb/A are most promising for use as pre-emergence treatments for the control of grassy weeds in peas".

At Farmington, Minnesota, prolonged control of both broad-leaf weeds and Setaria spp. with but minor effects on peas was obtained with monuron and G-27901 at 2 lb. and G-30031 at 4 lb/A. Similar control of Setaria spp. only was obtained with CP-6936 at 4 lb/A.

At Guelph, Ontario, several chemicals were applied to seeded plots infested with mixed broad-leaf annuals. Neburon at 4 lb. and DNBP at 6 lb/A gave excellent weed control without crop injury when applied at the end of May, whereas control with DNBP was considerably less when applied before mid-May.

Post-emergence. On an essentially weed-free basis at Madison, Early Perfection peas exhibited a high degree of tolerance to MCPA and the butyrics. MCPA amine and potassium salts up to a 16 oz/A rate did not adversely affect pea yields. The ester of 4-(2,4-DB) was considerably more toxic than the amine.

In tests at Farmington, where comparison was made of various acetic, propionic, butryic, carbamate, and triazine materials, all except dalapon and EPTC (at lowest rate) gave good control of broad-leaf weeds, and none of the materials gave good control of Setaria spp. without injuring peas.

A comparison of several acetic and butryic compounds was made at Lethbridge, and reasonable control of lamb's quarters with minimum injury to peas was obtained only with the sodium salts of 4-(MCPB) and 1:15 MCPA/4-(MCPB) at 16 oz/A, and 4-(2,4-DB) at 24 oz/A.

Of several materials tested at Guelph, only DNBP gave long-term control of broad-leaf weeds without injury to peas.

Abstracts

Pre-emergence applications for the control of grassy weeds in peas. Buchholtz, K.P. Plots of Early Perfection peas, sown in rows 7 inches apart, were given pre-emergence treatments with DNBP, dalapon, TCA, CDAA, CDEC, diuron and neburon. Applications of 2-chloro-4,6-bis (diethylamino)-s-triazine (CDT), 2-chloro-4,6-bis (ethylamino)-s-triazine (simazin), 2-chloro-4-diethylamino-6-isopropyl-s-triazine (30031), 2-chloro-4-ethylamino-6-diethylamino-s-triazine (27901), sodium 2,3-dichloroisobutyrate (IBA) and ethyl-N,N-di-n-propylthiocarbamate (EPTC) were also included in the trials.

The plots were heavily infested with grassy weeds, chiefly yellow foxtail. Estimates of grass growth were made about 3 weeks after treatment with an index of 10 representing a complete stand. The peas were harvested at the canning stage, yields determined and tenderometer readings made. Chemicals used, rates of application, yields, tenderometer readings and extent of grass control are shown in the table.

Material	Appl. lb/A	Shelled peas lb/A 1956	Shelled peas lb/A 1957	Tend. reading 1956	Tend. reading 1957	Grass growth index 6/7/56	Grass growth index 6/15/57
DNBP	4	2685**	--	131	--	5.8	--
	6	2865**	--	140	--	4.3	--
	8	3481**	5109*	138	135**	2.5	6.8
Dalapon	2	3360**	5789	142	130	5.0	7.0
	4	2727**	--	133	--	5.0	--
TCA	6	3260**	5659	140	140**	4.3	9.5
IBA	4	--	4187**	--	128	--	6.3
CDAA	4	3227**	5478	128	118	1.0	4.5
CDEC	4	2766**	5595	124	119	3.3	4.8
EPTC	4	--	5471	--	116	--	0.5
Diuron	1	2654**	--	127	--	2.5	--
	2	3216**	4187**	126	116	1.5	0.3
Neburon	2	2478**	--	123	--	5.3	--
	4	2370*	--	128	--	4.8	--
CDT	4	2354	--	127	--	5.8	--
Simazin	2	--	00	--	--	--	0.5
30031	2	--	4184**	--	110	--	1.3
27901	2	--	4760**	--	108*	--	0.8
Check	-	2061	5881	131	120	9.0	7.8
LSD 5% level		298	647	N.S.	11	--	--
1% level		357	872	--	14	--	--

In 1956 untreated peas suffered from the competition provided by the grass. In 1957 the growth of the peas was sufficient to subdue the grass. The data indicate that yields were increased in 1956 by applications of dalapon at 2 lb/A, TCA at 6 lb/A and CDAA at 4 lb/A. These applications did not reduce yields in 1957. Maturity of the peas was advanced by applications of dalapon and TCA in both years. Control of weeds by dalapon and TCA appeared to be only fair in 1956 and even poorer in 1957 but the weeds were stunted and apparently made little growth.

CDAA did not affect the maturity of the peas and gave good weed control in 1956 but only moderate control in 1957. EPTC appeared promising for use in 1957 for it did not reduce yields nor affect maturity and gave excellent control of weeds. Applications of DNBP at 8 lb/A and diuron at 2 lb/A gave erratic results. Both treatments increased yields in 1956 but reduced them in 1957. Control of weeds with diuron was excellent in both years while DNBP gave good control in 1956 and poor in 1957. The poor control of weeds in 1957 by several materials may have been due to the excessive rain that persisted for several weeks immediately after treatment of the plots.

On the basis of the trials it appears that dalapon at 2 lb/A, TCA at 6 lb/A, CDAA at 4 lb/A, EPTC at 4 lb/A and DNBP at 8 lb/A are most promising for use as pre-emergence treatments for the control of grassy weeds in peas. (Dept. of Agronomy, Univ. of Wisconsin, Madison).

Responses of canning peas to applications of MCPA, 4(MCPB) and 4(2,4-DB). Buchholtz, K.P. Plots of Early Perfection peas, drilled in rows 6 or 7 inches apart, were treated with various chlorinated phenoxy and butyric herbicides at several rates when from 4 to 6 inches tall. All materials were applied in water equal to 20 gal/A. Plots were harvested at the canning stage and yields of shelled peas and tenderometer readings obtained. The materials used included potassium and amine salts of MCPA as well as amine salts and esters of 4(MCPB) and 4(2,4-DB). Application rates, yields of shelled peas and tenderometer readings are recorded in the table. The plots were essentially weed free due to pre-emergence applications of DNBP at 6 lb/A.

Material	Appl. oz/A	Shelled peas -- lb/A 1955	1956	1957	Tenderometer reading 1955	1956	1957
MCPA-K	8	--	--	6598	--	--	120
MCPA-A	4	--	3415	6501	--	134	126
	8	4240**	2928	6562	130	133	121
	16	4271**	2523	--	125	126	--
4(MCPB)A	8	2913	3439	--	138	149	--
	16	3953*	3279	--	142*	144	--
	32	--	3427	--	--	132	--
4(MCPB)E	16	--	3259	--	--	125*	--
4(2,4-DB)A	8	2660	3408	6034	135	144	119
	16	2661	3612	6165	126	148	116*
	32	--	2953	6640	--	130	110**
4(2,4-DB)E	8	--	--	5659	--	--	107**
	16	--	3015	5515	--	126	98**
	32	--	--	4251**	--	--	101**
Check	--	2865	3043	6254	131	138	126
LSD 5% level		894	666	1128	10.0	12.9	10.4
1% level		1191	879	1512	13.4	17.0	14.0

The data are unusual in that no reduction in yields of shelled peas resulted from the application of 16 oz/A of MCPA in two trials or from 8 oz/A in three trials. The marked increase in yields of shelled peas from plots treated with MCPA in 1955 was probably due to a reduction in the extensive vine growth that occurred on the check plots in that year. The reduction in vine growth appeared to reduce the extent of stem rotting that occurred on the untreated plots. In 1957 there was no substantial difference in the toxicity of the potassium and amine salts of MCPA.

The amine and ester preparation of 4(MCPB) appeared to give no reduction in yields of shelled peas even when the amine preparation was applied at 32 oz/A. The data suggest that 4(2,4-DB) was slightly more toxic to peas than 4(MCPB) at the higher rates of application. Peas treated with 4(2,4-DB) showed considerable leaf malformation similar to those obtained after treatment 2,4-D but the yielding ability of the plants was only slightly affected. Data obtained in 1957 show that an ester preparation of 4(2,4-DB) was considerably more toxic to peas than an amine preparation.

The tenderometer readings did not show a consistant response on maturity of the peas due to the applications. In 1957 there was evidence that a number of the 4(2,4-DB) applications delayed the maturity of the peas materially. This delay was not reflected in reduced yields of shelled peas with the amine preparation of 4(2,4-DB). The reduced yields on plots treated with the ester preparation were probably associated with the delay in maturity.

The data cannot be considered a measure of the maximum injury to peas resulting from applications of the butyric compounds for MCPA also failed to reduce yields significantly in these trials. The data do show that the Early Perfection variety of peas has a high tolerance to MCPA, 4(MCPB) and 4(2,4-DB) under the conditions of the trials. (Dept. of Agronomy, Univ. of Wisconsin, Madison)

The effect of TCA on field peas. Chubb, W.O. and MacKey, E.M. Field peas on weed free plots were treated when 5 to 7 inches tall with 0, 3 and 6 lb/A acid equivalent of TCA alone and in combination with 4 oz/A acid equivalent of MCPA sodium and potassium salt. Total spray volume was about 7.5 gal (Imp.)/A. The first rainfall after treatment occurred 3 days later. Plot size was 3 rows by 16.5 feet, with no border rows. A split-plot design with 4 replicates of main treatments was used. About one month after spraying the different rates of TCA could easily be identified by vigor of growth of the peas but there were no visible differences between the MCPA treatments. The yield from the 3 lb TCA treatment (80.5 bu/A) was significantly lower than that from the 0 lb. TCA (89.1 bu/A). The yield from the 6 lb. TCA treatment (73.2 bu/A) was not significantly lower than the 3 lb.TCA but the difference approached significance. The MCPA and the MCPA x TCA interaction variances were not significant. (Contribution of Special Crops Substation, Portage la Prairie, Manitoba).

Pre-emergence weed control in canning peas, 1957. Nylund, R.E., D.C. Nelson, and D.H. Dinkel. Late canning peas (variety: #250) seeded on May 13 in silt clay loam soil at Farmington, Minnesota, were sprayed on May 16 with the following twenty herbicides: 4 lb. CDAA, 2 lb. monuron, 2 lb. diuron, 6 lb. DNBP amine, 2 lb. CDAA plus 3 lb. DNBP amine, 6 lb. tris-(2,4-dichlorophenoxyethyl) phosphite

(E.H. 3Y9), 2 and 4 lb. G-27901, 2 and 4 lb. G-30031, 2 and 4 lb. G-30028, 2½ and 5 lb. ethyl-N,N-di-n-propylthiocarbamate (EPTC), 4, 5, and 6 lb. C.P.-6936, and 6, 9, and 12 lb. 3,4-dimethylbenzophenone (3,4 DMB). Each of the above herbicides was applied at 30 psi pressure in 40 gal. water per acre to duplicated one-half square rod plots (4' x 33'). Every third plot was an unsprayed control plot so that each sprayed plot was adjacent to a control plot. At the time of application, no weeds had emerged and peas had not started to germinate. The soil was moist (1.02" rain on May 14), and the temperature was 61°F. on the day herbicides were applied. During the first 6 days following spraying, temperatures averaged 10°F. below normal, and rainfall totalled 1.43" (0.72" fell on the day after sprays were applied). The principal weeds present were Setaria spp. with a scattering of broad-leaved weeds: Chenopodium album, Amaranthus retroflexus, and Ambrosia artemisiifolia. Weed control ratings were recorded on May 29, June 18, and at harvest on July 18. Pea injury was rated on June 18. Pea yields, vine weights, and tenderometer readings were recorded on July 18. Herbicides which showed good to excellent grass control one month after application (June 18) were: CDAA, monuron, E.H. 3Y9, 4 lb. G-30031, 4 lb. G-30028, 5 lb. EPTC, and 4, 5, and 6 lb. C.P.-6936. At harvest (July 18) only the following showed good to excellent grass control: monuron, 2 and 4 lb. G-27901, 4 lb. G-30031, and all rates of C.P.-6936. While broad-leaved weeds were a minor problem in the field, the following herbicides gave good to excellent control one month after spraying: monuron, diuron, E.H. 3Y9, both rates of G-27901, G-30031, and G-30028, and 6 lb. C.P.-6936. At harvest monuron, diuron, DNBP amine, CDAA plus DNBP amine, and both rates of G-27901, G-30031, and G-30028, showed good broad-leaved weed control. Only two herbicides, E.H. 3Y9 and both rates of G-30028 caused significant injury to the pea vines. This injury is not reflected in vine weights, yields of shelled peas, or tenderometer readings obtained at harvest although the E.H. 3Y9 tended to give a lower yield of shelled peas and these peas were less mature than those from other plots. All of the other herbicide treatments produced yields as high as or slightly higher than their adjacent checks. However, none of the vine weights, pea yields, or tenderometer readings differed significantly in this trial. (Paper No. 3843, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Post-emergence weed control in canning peas, 1957. Nylund, R.E., D.C. Nelson, and D.H. Dinkel. Late canning peas (variety: 250) seeded on May 13 in silt clay loam soil at Farmington, Minnesota, were sprayed on May 29 with the following herbicides: 1, 2, and 3 lb. DNBP amine, 1 lb. dalapon, 1 lb. dalapon plus 1 lb. DNBP amine, 4 and 6 oz. MCPA amine, 1/2 and 1 lb. MCPB amine, 1/2 and 1 lb. 2,4DB amine, 1/2 and 1 lb. 2,4DB ester, 1 lb. dalapon plus 1/2 lb. 2,4DB ester, 2½ and 5 lb. ethyl-N,N-di-n-propylthiocarbamate (EPTC), 2 and 4 lb. G-30031, and 2 and 4 lb. G-27901. Each of the above treatments was applied at 30 psi pressure in 40 gal. water per acre to duplicated one-half square rod plot. Each sprayed plot was adjacent to an unsprayed control plot. At the time of spraying, the principal weed species present, Setaria spp., were 1/2 inch tall and in the early one-leaf stage. The soil, at spraying, was wet (1.50" rain on May 25; 0.25" on May 27), and the temperature was 70°F. Peas were in the 2-to 4-node stage and 1 to 2 inches tall. During the first 6 days following spraying, temperatures were normal for the period,

and the only rain recorded was 0.32" on May 31. Control of all weeds was rated two weeks after spraying (June 13) and pea injury ratings, broad-leaved and grass control ratings were recorded on June 18. Yields of vines and shelled peas and maturity (as obtained with the tenderometer) were recorded at harvest on July 18. All of the herbicides except dalapon and 2½ lb. EPTC gave good to excellent broad-leaved weed control. Only dalapon, the mixtures of dalapon with DNBP amine and 2,4DB ester, and both rates of G-30031 and G-27901 gave good grass control. However, all of the treatments which gave good grass control, with the possible exception of 2 lb. G-27901, also caused significant pea injury. None of the herbicide treatments significantly affected final yields and crop maturity although the dalapon-2,4DB ester mixture tended to both delay maturity and reduce yields. (Paper No. 3842, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Effect of several herbicides used for control of broad-leaf annual weeds in processing peas. Sexsmith, J.J. Dark Skin Perfection peas were seeded May 17, 1957, on a silty clay loam irrigated soil. On June 19, when the peas ranged from 4 to 8 inches tall with from 4 to 6 leaves, the following treatments were applied to quadruplicate plots at a solution rate of 20.1 gal/A: dimethylamine of 2,4-D and diethanolamine of MCPA at 4, 8, and 12 oz/A; sodium salts of 4-(MCPB) and 4-(2,4-DB), and a 1:15 mixture of the sodium salts of MCPA/4-(MCPB) at 8, 16, and 24 oz/A; and the diethanolamine of MCPA at 8 oz/A mixed with the sodium salt of TCA at 4, 6, and 8 lb/A. The plots contained only a very light infestation of lamb's quarters (Chenopodium album) and red-root pigweed (Amaranthus retroflexus), and the crop stand was not sufficiently uniform for yield sampling. One month after treatment weed control and crop injury ratings were made. Results: All treatments gave better control of lamb's quarters than of red-root pigweed, being approximately twice as good for all treatments but the MCPA-TCA mixtures. Reasonably good control of lamb's quarters was obtained with the 8-oz rate of the amines of 2,4-D and MCPA, the 16-oz rate of the sodium salt of 4-(MCPB) and the MCPA/4-(MCPB) mixture, and the 24-oz rate of the sodium salt of 4-(2,4-DB). Minimum injury to the pea crop consistent with reasonable control of lamb's quarters was obtained only with sodium salt compounds used. The addition of TCA to the diethanolamine of MCPA enhanced the effectiveness of the MCPA against the weeds, but not without causing very serious stunting and delay to the pea crop. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Pre-emergence weed control in canning peas. Switzer, Clayton M. Quadruplicate 30 foot plots of W.R. Perfection canning peas were sprayed 3 days after planting (May 11, 1957) by means of a CO_2 pressurized sprayer. The herbicides were applied in aqueous solution at the rate of 40 gallons per acre as a band 18" wide centered on the row. The soil was wet following a heavy rain (1.0 in.) the day before treatment and the temperature was 55°F. Injury to the peas was assessed two weeks after treatment and weed control 5 weeks after treatment, at which time the weeds present in 3 one sq. ft. segments of each replicate were counted.

Treatments included DNBP (6), 3Y9 (3), N-5521 (6), EPTC (4 & 8), and FW-450 (6). Rates are lb/A of active material. Excellent weed control (80-95% reduction in weed count) was obtained by the use

of 3Y9 and N-5521. Peas treated with N-5521 were slightly retarded at first but soon recovered. The herbicide 3Y9 brought about considerable early distortion of the plants resulting in decreased yield and peas treated with FW-450 became badly stunted with their yield reduced almost 75%. DNBP gave 75% reduction in weed count and had no effect on the peas. EPTC had no effect on either peas or weeds at the rates used.

Additional pre-emergence herbicides were tested in a similar experiment on peas planted May 27. These chemicals were applied immediately following planting to a moist soil (0.2 in. rainfall two days previously) with the air temperature 55°. Injury to the peas and weed control were assessed as in the first experiment.

Treatments included CDAA (4 & 6), neburon (4 & 6), CIPC (4 & 6), and DNBP (6). None of these chemicals injured the peas. Neburon at both rates gave the best control - over 95% reduction of weed stand - closely followed by DNBP. CIPC reduced weed stand 75-80% and CDAA 25-30%. The major weed species present in the control plots were common chickweed (Stellaria media) spiny annual sow thistle (Sonchus asper) and purslane (Portulaca oleracea). (Contributed by the Department of Botany, Ontario Agricultural College, Guelph, Canada).

Post-emergence weed control in canning peas. Switzer, Clayton N. Quadruplicate 30 foot rows of W.R. Perfection canning peas planted May 8, 1957 were treated June 4 when the plants were about 4 in. in height. The temperature was 75° at time of spraying and the soil was moist from a 0.25 in. rainfall June 1. There was no further rainfall until June 11. All chemicals, with the exception of granular CIPC, were applied as aqueous sprays at the rate of 40 gal/A by means of a CO_2 pressurized sprayer, as a band 18 in. wide centered on the row.

Injury to the peas and weed control were estimated June 10, and weed counts (3 one sq. ft. segments of each replicate) were made June 18. Pods were harvested at an average tenderometer reading of 88 on July 15.

Treatments included DNBP (1 & 1.5), MCPA (.25 & .5), Tropotox (1, 1.5 & 2.0), Tropotox A (1.0 & 1.5), MCPB-BE (0.5, 1.0 & 1.5), 2,4-D amine (0.5), 2,4-DB (0.5 & 1.0), granular CIPC (4 & 6), and EPTC (6). Rates are expressed as lb/A of active material. With the exception of granular CIPC and DNBP all herbicides injured the peas to some extent. However, recovery was complete except in the plots treated with EPTC and Tropotox 2 lb/A. Yields, as measured by total weight and total number of pods, were not reduced by any treatment other than these two. DNBP at both rates gave excellent weed control, and good early control was obtained with the higher rates of MCPA, Tropotox, Tropotox A and MCPB-BE. However, only the DNBP treatments brought about more-or-less long term weed control, as in the others there was marked recovery of weeds within 3 wk. of spraying. (Contributed by the Department of Botany, Ontario Agricultural College, Guelph, Canada).

Sum

eme
sat
con
How
con
tic
bee

and
muc
for

G-3
wee
3,4
yie
cro
cro
fox
rot

C.P
con
and
inj
spr
ano
Sim

fai
CDA
see
res
goo
soi
the
wit

eme
and
30
dal
bot
eff

Onions, Potatoes, and Root Crops

R. E. Nylund

Summary

Beets. In a muck soil infested with both broad-leaved and grass weeds, pre-emergence applications of mixtures of CDAA with either TCA or dalapon gave satisfactory weed control while the same herbicides used alone gave poor weed control. In the same trial, EPTC at 2.5 and 5 lb. gave poor weed control. However, in another trial on mineral soil, EPTC at 5 lb. gave fairly good control of broad-leaved weeds. In the latter trial, a pre-emergence application of Simazin at 2 lb. per acre gave excellent weed control without causing beet injury as did a pre-planting application of 5 lb. Vapam.

Pre-planting treatments on plots sown to either wild oats or green foxtail and then seeded to various vegetable crops showed beets to be tolerant of as much as 6 lb. of EPTC and CIPC. (see "Annual and Winter Annual Grass Weeds" for abstract).

Carrots. In muck soil, pre-emergence application of monuron, G-27901, G-30031, Stoddard solvent, and a mixture of monuron plus TCA gave acceptable weed control without crop injury. In the same test, Simazin, EPTC, PCB, and 3,4-DMB failed to give adequate weed control, while C.P.-6936 reduced carrot yields. On a mineral soil, Simazin and EPTC gave good weed control without crop injury, and Vapam applied pre-planting gave about 50% weed control without crop injury. In a pre-planting treatment trial to control seeded wild oats and foxtail, 6 lb. EPTC severely injured carrots, 15 lb. PCB completely killed carrots, and 6 lb. CIPC caused only slight injury.

Onions. On muck soil, pre-emergence applications of CDAA, CDAA-T, monuron, C.P.-6936, CIPC and monuron plus CDAA, all gave commercially satisfactory weed control without crop injury. Simazin, EPTC, and 3,4 DMB gave poor weed control, and the latter two chemicals together with a CIPC-CDAA mixture caused some crop injury. In a pre-emergence trial on mineral soil in which a variable dosage sprayer was used, EPTC seriously damaged onions at 0.9 lb./A. However, in another trial EPTC at 5 lb. gave fair weed control without crop injury as did Simazin at 2 lb.

In post-emergence trials on muck soils, CIPC at 8 lb. continued to give fair to good weed control with only slight injury. In a comparison of CIPC and CDAA, the latter was found to be less toxic to onions. In a muck trial with seeded onions and in a trial on mineral soils with transplanted onions, similar results were obtained with several herbicides: CIPC, monuron, and Simazin gave good to excellent weed control while EPTC gave poor control. On the mineral soil, CDAA also gave excellent control while TCA gave only fair control. On the muck soil, mixtures of CIPC with CDAA or monuron gave good weed control without excessive crop injury.

Potatoes. In a trial in which eight potato varieties were sprayed at emergence, 10 lb. dalapon plus 3 lb. DNBP amine gave better control of grasses and broad-leaved weeds than 10 lb. dalapon alone and almost as good control as 30 lb. dalapon alone. Yields of White Rose were decreased by the 30 lb. dalapon treatment, and the pigmentation of red-skinned varieties was reduced by both rates of dalapon, the degree of color loss increasing with rate. (This effect has also been found in unpublished trials in North Dakota and Minnesota.)

On muck soils, DNBP amine, mixtures of DNBP amine with TCA or dalapon, and mixtures of monuron with TCA or dalapon gave excellent weed control.

Pre-planting applications of IPC, CIPC, CDAA, CDEC, EPTC, DCU, and PCB to control wild oats and other grasses, caused no injury to potatoes. (see "Annual and Winter Annual Grass Weeds" for abstract).

Sweet Potatoes. In one post-transplanting trial reported, NPA (Alanap 20G) and G-27901 gave good weed control with crop injury. In another trial, neburon gave excellent crabgrass and carpetweed control without crop injury.

Abstracts

Beets

Pre-emergence weed control in muckland-grown red beets, 1957. Nylund, R. E., D. C. Nelson, D. H. Dinkel. King Red beets seeded in muck soil on April 29 were sprayed on May 6 (two days before emergence) with the following herbicides: 4, 6, and 8 lb. dalapon, 4 lb. CDAA, 6 and 9 lb. TCA (sodium salt), 2.5 and 5 lb. ethyl-N,N-di-n-propylthiocarbamate (EPTC), 4 and 6 lb. C.P.-6936, 6 and 9 lb. 3,4-dimethylbenzophenone (3,4-DMB), 2 lb. CDAA plus 6 lb. TCA, 4 lb. CDAA plus 6 lb. TCA, 2 lb. CDAA plus 4 lb. dalapon, and 4 lb. CDAA plus 4 lb. dalapon. Each herbicide was applied at 30 psi pressure in 80 gal. water per acre to 16' single-row plots replicated five times. Temperature on the date of application was 74° F. and the soil surface was dry but the subsoil was moist. Temperatures during the week following herbicide application averaged 62° F.; no rain fell until the 6th day when 0.16" was recorded. On the 8th day 1.45" rain was recorded. Weeds, which emerged mostly after herbicide application, included Setaria spp., Echinochloa crusgalli, Polygonum pennsylvanicum, Capsella bursa-pastoris, Amaranthus retroflexus, Chenopodium album, and Portulaca oleracea. Weed control and beet injury ratings were recorded three weeks after spraying, and beet yields were recorded on July 23. The only herbicides which gave commercially satisfactory weed control were the mixtures: 2 lb. CDAA plus 6 lb. TCA or 4 lb. dalapon, and 4 lb. CDAA plus 6 lb. TCA or 4 lb. dalapon. All of the herbicides except 2.5 lb. EPTC caused some injury to the beets. However, this injury was reflected in reduced beet yields only with the herbicide mixtures: 4 lb. CDAA plus 6 lb. TCA and 4 lb. CDAA plus 4 lb. dalapon. (Paper No. 3834 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Carrots

Pre-emergence weed control in muckland carrots, 1957. Nylund, R. E., D. C. Nelson, D. H. Dinkel. Nantes carrots seeded in muck soil on April 29 were sprayed on May 6 with the following herbicides: 1.6 lb. monuron, 2 lb. polychlorbenzoic acid (PCB), 1 and 2 lb. 2-chloro-4, 6-bis (ethylamino)-s-triazine (Simazin), 2 and 4 lb. G-27901, 2.5 and 5 lb. ethyl-N,N-di-n-propylthiocarbarnate (EPTC), 4 and 6 lb. C.P.-6936, 6 and 9 lb. 3,4-dimethylbenzophenone (3,4-DMB), and 0.8 lb. monuron plus 8 lb. TCA. Two days later (May 8) the following herbicides were applied: 80 gal. Stoddard solvent, and 2 and 4 lb. G-30031. Each of the herbicides was applied at 30 psi pressure in 80 gal. water per acre, except Stoddard solvent which was applied undiluted, to 16' single-row plots replicated five times. Temperature on May 6 was 74° F.; on May 8, 70° F. Soil surface was dry on both dates (no rain had fallen since planting). Temperatures during the week following application averaged 62° F. Following herbicide application, no rain fell until the 6th day when 0.16" was recorded. On the 8th day, 1.45" was recorded. Weeds, which emerged mostly

after herbicide application, included Setaria spp., Echinochloa crusgalli, Polygonum pennsylvanicum, Capsella bursa-pastoris, Amaranthus retroflexus, Chenopodium album and Portulaca oleracea. Weed control and carrot injury ratings were recorded three weeks after spraying and carrot yields were obtained at harvest on August 16. The only treatments which gave acceptable weed control were 80 gal. Stoddard solvent, 1.6 lb. monuron, 4 lb. G-27901, 2 and 4 lb. G-30031, and the mixture of 0.8 lb. monuron plus 8 lb. TCA. The only herbicide which noticeably injured the carrots was C.P.-6936 which also significantly reduced carrot yields. (Paper No. 3839 of the Scientific Journal Series of the Minn. Agr. Exp. Sta.)

Onions

Post-emergence weed control in onions. Cotter, D. J. and James W. Herron. Southern plants (variety Yellow-Spanish hybrid) were transplanted April 6, 1957, in a medium-textured soil. One series of treatments listed below was applied on April 24. One half of each plot received a second application on June 7, immediately following hand weeding. The weather after April 24 was wet. Dry weather followed the second application. Each whole plot size was 4 rows 20' long, arranged in a randomized block design with 2 applications. The weed population was almost completely crabgrass (Digitaria sanguinalis) with a few ragweed plants (Ambrosia artemisiifolia). No apparent injury was noted in the crop from any of the chemicals. Yield data were not recorded due to a misunderstanding with the cooperator. The weed data are presented below:

		First Application		Second Application
Chemical	Rate lb/A (active)	Percent Weed Control (16 days)	Weed Control Rating* (80 days)	Weed Control Rating* (30 days)
CIPC (Emulsion)	3	75	6.5	3.5
	6	93	3.5	2.0
	9	96	4.0	2.0
CIPC (granular)	3	85	9.0	4.0
	6	83	9.5	3.5
	9	98	5.5	2.0
CDAA	4	89	6.0	6.0
	6	98	4.5	2.0
TCA	6	31	6.5	3.5
	8	82	6.0	1.5
Monuron	1	93	8.5	4.0
	1.5	99	3.5	1.0
Simazin	1	96	7.0	2.5
	1.5	96	4.5	2.0
ACP 307	6	74	8.0	4.0
EPTC	3	0	10.0	5.5
	6	55	9.0	3.0
Check	-	0	9.5	8.0

*1 = irradication, 5 commercial control, 10 = no control

All materials except EPTC gave satisfactory weed control 16 days after the early application. Ratings made 30 days after first application show Monuron 1.5 lb, Simazin 1.5 lb, CDAA 6 lb, and CIPC (emulsion) 9 lb, as giving commercially acceptable control of weeds. The data suggest a high rate of CIPC may provide sufficient residual for commercial weed control with 1 application.

Ratings taken from the second application follow the same general trend as the early applications for all chemicals except EPTC and TCA 8 lb/A which were more effective during dry weather. (Department of Horticulture, Kentucky Agricultural Experiment Station, Published with the approval of the director.)

Effect of pre-emergence herbicidal treatments on onions. Friesen, G. A commercial onion field near E. St. Paul, Manitoba, was selected for this experiment. Six herbicides were applied on May 17; one week after seeding the onions. No weed growth or crop had emerged at time of spraying. A variable dosage sprayer was used and the respective dosage spectrum for each herbicide (active ingredient) was as follows: CDAA, CIPC, and CP-13042 at ½ to 8 lb/A; EPTC and CP-6840 at 3/4 to 12 lb/A; and Calcium cyanamide (Aero Cyanamid Special Grade 57%) at 2 to 30 lb/A. All treatments were conducted in duplicate and total spray volume was 30 gal/A. Final notes on weed control were recorded on June 21 and 90% weed control was considered satisfactory. Weed species were predominantly barnyard grass and redroot pigweed. Results:- CIPC at 3.6 and 5.2 lbs/A controlled barnyard grass and redroot pigweed respectively. CDAA at 1.7 and 2.7 lb/A controlled barnyard grass and redroot pigweed respectively. CP-13042 at 5.8 lb/A controlled barnyard grass. EPTC at 3.6 lb/A controlled barnyard grass but seriously damaged onions at .9 lb/A. Other herbicides failed to give any measure of weed control at even the highest application rates. (Contribution from the Division of Plant Science, University of Manitoba, Winnipeg).

Pre-emergence weed control in muckland onions, 1957. Nylund, R. E., D. C. Nelson, and D. H. Dinkel. Brigham Yellow Globe onions seeded in muck soil on April 29 were sprayed on May 6 (onions sprouted but not emerged) with the following herbicides: 4 lb. CDAA, 4 lb. CDAA-T, 1.6 lb. monuron, 1 lb. 2-chloro-4, 6-bis (ethylamino)-s-triazine (Simazin), 2.5 and 5 lb. ethyl-N, N-di-n-propylthiocarbamate (EPTC), 4 and 6 lb. C.P.-6936, 6 and 9 lb. 3,4-dimethylbenzophenone (3,4-DMB), 8 lb. CIPC, and mixtures containing 2 lb. CDAA plus 0.8 lb. monuron or 4 lb. CIPC. Each herbicide was applied at 30 psi pressure in 80 gal. water per acre to 18' single-row plots replicated five times. The temperature on the application date was 74° F. and the soil surface was dry but the subsoil was moist. Temperatures during the week following herbicide application averaged 62° F. Following application of herbicides, no rainfall until the 6th day when 0.16" was recorded. On the 8th day, 1.45" of rain was recorded. Weeds, which emerged mostly after application, were principally the annual grasses, foxtails (Setaria spp.) and barnyard grass (Echinochloa crusgalli) and smartweed (Polygonum pennsylvanicum), shepherd's purse (Capsella bursa-pastoris), pigweed (Amaranthus retroflexus), lambsquarters (Chenopodium album), and purslane (Portulaca oleracea). Weed control and onion injury ratings were recorded 25 days after spraying. Due to excessive rainfall during July and August which drowned out part of the field, no yield data were recorded. All of the treatments except Simazin and 6 lb. 3,4-DMB gave some weed control. However, only the following gave commercially acceptable weed control: CDAA, CDAA-T, monuron, 6 lb. CP-6936, CIPC, monuron plus CDAA, and CIPC plus CDAA. Of these, only the CIPC-CDAA mixture caused any significant degree of crop injury. 3,4 DMB gave relatively poor grass control, while EPTC, Randox, and C.P.-6936, gave relatively poor broad-leaved weed control. (Paper No. 3838, Scientific Journal Series, Minnesota Agricultural Experiment Station).

Early post-emergence weed control in muckland onions, 1957. Nylund, R. E., D. C. Nelson and D. H. Dinkel. Brigham Yellow Globe onions seeded in muck soil on April 29 were sprayed on May 29 (onions in the early one-leaf stage) with the following herbicides: 1.6 lb. monuron, 4 and 8 lb. CIPC, 1 and 2 lb. 2-chloro-4, 6-bis (ethylamino)-s-triazine (Simazin), 2.5 and 5 lb. ethyl-N, N-di-n-propylthiocarbamate (EPTC), 2 and 4 lb. G-27901, 4 and 6 lb. C.P.-6936, 6 and 9 lb. 3,4-dimethylbenzophenone (3,4-DMB), and the mixtures 0.8 lb. monuron plus 4 lb. CDAA, 0.8 lb. monuron plus 4 lb. CIPC, 0.8 lb. monuron plus 8 lb. CIPC, and 4 lb. CIPC plus 4 lb. CDAA. The herbicides were applied as over-all sprays at 30 psi pressure in 80 gal. water per acre to 18' single-row plots replicated five times. On the day treatments were applied, the temperature was 65° F., the soil was wet (1.27" rain during 4 preceeding days), and smartweed had 2 to 6 leaves, shepherd's purse - 6 leaves, lambsquarters' - 4 leaves, annual grasses (foxtail and barnyard grass) - 2 leaves, pigweed - 2 to 4 leaves, and purslane - 4 leaves. During the first 12 days following herbicide applications the mean temperature was 66° F., and rainfall totalled 0.11". Weed control and onion injury ratings were recorded 12 days after spraying. All of the treatments except EPTC gave some weed control but only the following gave commercially satisfactory control without excessive onion injury: 8 lb. CIPC, 1 lb. Simazin, 2 lb. G-27901, 0.8 lb. monuron plus 4 lb. CIPC, and 4 lb. CIPC plus 4 lb. CDAA. Due to partial drowning out of the plots during July and August, no yield data were obtained. (Paper No. 3837, Scientific Journal Series, Minnesota Agricultural Experiment Station).

Post-emergence chemical weed control in onions. Maywell, C. G. Autumn Spice onions growing on muck soils at Bradford, Ont., were sprayed on July 4, 1957, over the row when the onions were 6 to 8 inches high with CIPC at 5 and 8 lbs/A and CDAA at 3 and 6 lbs/A. Single row plots 20 ft. long were used with 6 replications. The plots were kept weed free for the entire growing season. The CIPC 5 plots were yellowish green and the leaves were not as upright as the untreated onions for a short period within one week of treatment. CIPC 8 plots were affected for a longer period. CDAA plots at both rates were similar to the check plots. Onions were topped and weighed on Sept. 17, 1957. Average yields were CIPC 5 - 26.7 lbs/20 ft. of row, CIPC 8 - 24.2 lbs., CDAA 3 - 27.7 lbs., CDAA 6 - 27.0 lbs., Check - 26.7 lbs. The yield reduction was not statistically significant but CIPC at 8 lbs/A was the lowest in two replicates and next to the lowest in the other four. (Department of Botany, Ontario Agricultural College, Guelph, Canada).

Potatoes

Varietal response of potatoes to dalapon. Freeman, J. A. and H. A. Nagel. This experiment was designed to study the response of eight potato varieties to pre-emergence applications of dalapon alone and dalapon plus DNBP amine. A previous test in 1956 showed that a combination spray of dalapon and DNBP amine gave good grass and broadleaf weed control. This treatment had no adverse effect upon tuber quality or yield of Green Mountain potatoes. On May 30, 1957, the following treatments were applied just as the potatoes were beginning to emerge: dalapon 10 lb. plus DNBP amine 3 lb/A, dalapon 10 lb/A, dalapon 30 lb/A. A cultivated (weeded) check plot was included in each replicate. Treatments were applied with a power sprayer at the rate of 40 gal/A and 40 psi. The eight varieties included in this test were Green Mountain, Red Pontiac, White Rose, Netted Gem, Warba, Kennebec, Katahdin and Early Epicure. The soil was a heavy clay and was relatively moist at time of spraying. There was ½ inch of rain 7 days after treatments were applied, and an accumulation of 2 3/4 inches of rainfall 30 days after treatment. Dominant weeds were water foxtail (Alopecurus geniculatus), plantain (Plantago major and lanceolata), lamb's quarters (Chenopodium album), prostrate knotweed (Polygonum aviculare), smartweed (Polygonum persicaria), wild buckwheat (Polygonum convolvulus), and sheep sorrel (Rumex acetosella). Some scattered patches of couch grass (Agropyron repens)

were also present. Results: Dalapon 10 lb. plus DNBP amine 3 lb/A gave good control of grasses and broadleafs, except wild buckwheat, sheep sorrel and prostrate knotweed. Dalapon at 10 lb/A controlled grasses but only slightly affected broadleafs, whereas the 30 lb/A rate controlled grasses and most broadleafs except wild buckwheat and prostrate knotweed. This last rate stunted the growth of sheep sorrel. No potato plant injury was evident on any variety except White Rose which exhibited some leaf crinkling from the 30 lb/A dalapon rate, but no eventual reduction in plant size occurred. Date of emergence, dry matter content and total yield were not influenced by treatment. Marketable yield of White Rose was reduced by the 30 lb/A dalapon rate. At harvest, Red Pontiac tubers had turned light red in colour from treatments containing 10 lb/A dalapon, and pale pink from the 30 lb/A application. Most of the pink colouration from eyes of the Warba variety was "bleached out" by the 30 lb/A dalapon rate. Effect of treatment upon cooking and storage quality and germination ability will be conducted at a later date. This experiment will be repeated in 1958 to determine seasonal effect of treatment upon variety. (Canada Experimental Farm, Agassiz, B.C.)

Pre-emergence weed control in muckland potatoes, 1957. Nylund, R. E., D. C. Nelson, and D. H. Dinkel. Cherokee potatoes planted in muck soil on April 29, were harrowed across the rows on May 8 and sprayed on May 15 with the following herbicides: 6 and 9 lbs. DNBP amine, dalapon, 1.6 lb. monuron, 4 lb. CDAA, 2.5 and 5 lb. ethyl-N, N-di-n-propylthiocarbamate (EPTC), 4 and 6 lb. C.P.-6936, 6 and 9 lb. 3,4-dimethylbenzophenone (3,4-DMB), 2 and 4 lb. 2-chloro-4, 6 bis (ethylamino)-s-triazine (Simazin), 2 and 4 lb. G-27901, 6 lb. DNBP amine plus 10 lb. TCA, 6 lb. DNBP amine plus 8 lb. dalapon, 1.6 lb. monuron plus 10 lb. TCA, and 1.6 lb. monuron plus 8 lb. dalapon. Each of these was applied at 30 psi pressure in 80 gal. water per acre to 18' single-row plots replicated five times. The temperature at the time of application was 55° F. and the soil was wet following 1.45" rain on the day before spraying. Emerged weeds were few and mostly in the cotyledon stage. During the first six days following spraying, temperatures averaged 49° F., and rainfall totalled 1.60", all of which fell on May 20. Weed control ratings were recorded two weeks after spraying. Although all of the herbicide treatments except EPTC at 2.5 lb. gave some weed control, only the following gave commercially acceptable control (50% or higher): 9 lb. DNBP amine, 4 lb. CDAA, 6 lb. C.P.-6936, 4 lb. Simazin, 6 lb. DNBP amine plus 10 lb. TCA, 6 lb. DNBP amine plus 8 lb. dalapon, 1.6 lb. monuron plus 10 lb. TCA, and 1.6 lb. monuron plus 8 lb. dalapon. Of these, only Simazin and the mixture of monuron and dalapon caused visible stunting of the potato plants (as recorded one month after spraying). Due to excessive rainfall during the months of July and August, parts of the potato field were drowned out and thus no yield data were obtained. (Paper No. 3835, Scientific Journal Series, Minnesota Agriculture Experiment Station.)

Sweet Potatoes

Chemical weed control in sweet potatoes. Hemphill, D. D. Replicated, randomized plots of sweet potatoes, Early Puerto Rico var., were sprayed overall one week after transplanting with the following chemicals: NPA (Alanap 2) 4lb/A, NPA (Alanap 20 G) 4 lb/A, Simazin 1 lb/A and Simazin related compound G-27901 2 lb/A. NPA (Alanap 2) did not give adequate weed control and Simazin caused initial stunting. Average yields in pounds per plot were: Control 34.75, NPA (Alanap 2) 27.5, NPA (Alanap 20G) 43.63, Simazin 24.75 and G27901 36.50. High weed population probably reduced yields in NPA (Alanap 2) plots. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station, Journal Series Paper No. 1805, approved by Director of Missouri Agricultural Experiment Station.)

Weed Control in Sweet Potatoes. Warren, G. F. Sweet potato plants of the Acadian variety were set with a machine in a fine sandy soil on May 18. Immediately after transplanting the following treatments were applied in 100 gal. of water per acre: NPI (N-1 napthyl phthalimide) 4 lb/A; CIPC, 2 lb; neburon, 2,4 and 8 lb; CDEC, 4,8 and 12 lb. The temperature was approximately 75° F., and the soil was wet when spraying was done. During the next 8 days 6.23 inches of rainfall was recorded. Treatments were replicated 6 times. Counts of crabgrass (Digitaria sanguinalis) made June 6 showed 56, 74 and 86% control for 2, 4 and 8 lb of neburon respectively. NPI and CIPC gave 46 and 53% control respectively while none of the CDEC treatments significantly reduced crabgrass numbers. Neburon at all rates gave 97 to 100% control of carpetweed (Mollugo verticillata). CDEC at 12 lb gave 83% control, CIPC 69% and NPI 63%. CDEC at 4 and 8 lb gave less than 45% control. At 12 lb, CDEC caused some apparent stunting of the sweet potato plants early in the season and resulted in a 10% reduction in stand and a 20% reduction in yield of No. 1 potatoes. There was no observed injury from any of the other treatments and no significant stand reduction. However, both CIPC and NPI did give a 16% reduction in yield which was statistically significant. Based on these results, neburon appears worthy of further trial for weed control in this crop. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Miscellaneous

Pre-emergence weeding of ten vegetables. Dabbs, D. H. and D. E. Forsberg. A preliminary, single-plot trial of Vapam (sodium methyldithiocarbamate) and EPTC (ethyl N,N-di-n-propyl thiolcarbamate), both at 5 lbs. active/A, and Simazin (2-chloro-4, 6-bis(ethylamino)-S-triazine) at 2 lbs. active/A was conducted on ten vegetables in 1957. Simazin and EPTC were applied immediately following seeding of the vegetables, and Vapam fifteen days prior to seeding. Results: Weed counts on July 16 (per 2500 sq. ins.) were, Vapam 218, Simazin 70, non-weeded check 453, and EPTC 178. Weeds consisted mainly of redroot pigweed, stinkweed, shepherds' purse and common groundsel. The entire block was hand-weeded on July 18. By September 6, regrowth of young weeds was quite heavy for all but the Simazin block, which was nearly free of weeds. In the Simazin block, corn, beets, carrots and onions performed well, but bean plants appeared to be adversely affected. A number of pods had small depressed, darker green areas and, by late summer, the leaves showed symptoms similar to Halo Blight. Simazin appeared somewhat toxic to young pea and radish plants. Susceptible vegetables were lettuce, cucumbers and tomatoes. EPTC rated second in early season weed control. However, later regrowth was as heavy as the check. Most vegetables performed well. Vapam also gave fair weed control in the early season. Later regrowth was as heavy as the check. Most vegetables performed reasonably well. (Contribution from Experimental Farm, Scott, Saskatchewan, Canada.)

Other Vegetables

G. F. Warren

Summary

In addition to the abstracts in this section the reader is referred to some appearing in the sections on "Annual and Winter Annual Grass Weeds" and "Onions, Potatoes and Root Crops", which include information on several vegetable crops.

Beans. In pre-emergence trials DNBP usually gave satisfactory weed control and did not injure either snap or lima beans. CDAA caused little or no crop injury but weed control was frequently unsatisfactory. EPTC showed promising results and no crop injury in five experiments but injury to snap beans was reported in one trial. In less extensive tests CIPC gave good results. Simazin and related triazine compounds caused severe injury to snap beans and small-seeded limas but some of these compounds did not damage large-seeded limas.

Sweet Corn. This crop showed good resistance to pre-emergence treatments with Simazin and related triazine compounds except for G-30044 (2-methoxy-4,6-bis-(ethylamino)-s-triazine). Simazin gave the best weed control of this group where direct comparisons were made. Sweet corn was not injured by DNBP and weed control was usually satisfactory for a short time. CDAA caused no crop damage but weed control was often unsatisfactory. In less extensive trials, EPTC and neburon gave promising results while CDEC failed to control weeds.

Celery. Post-emergence applications of MCPB and 2,4-DB gave considerable weed control and little or no crop injury.

Other Crops. Single abstracts are included on weed control in asparagus, cucumbers, peppermint, transplanted tomatoes and seedbeds, as well as one on the effect of 2,4-D spray drift on tomatoes and one on the relation of timing and soil moisture to the effectiveness of CDAA. Due to the diversity of the information contained in these they can not be satisfactorily summarized and the reader is referred to the individual abstracts.

Abstracts

Beans and Sweet Corn

Pre-emergence and emergence weed control in lima beans, snap beans, and sweet corn with DNBP. Alban, E. K. and Brubaker, K. K. DNBP (4,6-dinitro ortho secondary butylphenol) was used in a total of 22 weed control field trials on lima beans (Fordhook 242), snap beans (Tendergreen), and sweet corn (Golden Cross Bantam and Golden Security) during the summers of 1955, 1956, and 1957. From season to season size of plots varied from two 20-foot rows to two 30-foot rows, and in number of replications from 5 to 8. Three to 6.0 lbs/A of DNBP (Dow Premerge) was applied with a plot sprayer as over all pre-emergence or emergence treatments. Control of grasses (Digitaria sp. and Setaria sp.), Amaranthus retroflexus, and Portulaca oleracea, these being the major weeds present, was rated visually by comparison with unweeded check plots approximately three and six weeks after treatment. Plots in which weed control was poor were hand weeded. Growth and yield were examined for evidence of crop damage. Results: None of the crops treated were injured visually nor were yields reduced by pre-emergence and emergence applications of from 3.0 to 6.0 lbs/A of DNBP. Weed control varied from almost none to excellent control, in most cases satisfactory for a short period of time. Control

of grasses and Amaranthus was generally not as good as control of Portulaca, the latter species being controlled especially well during 1956 and 1957. Time of application did not seem to be directly related to general effectiveness of weed control, although under 1957 conditions of favorable soil moisture, delayed pre-emergence and emergence applications were both uniformly effective. (Ohio Agr. Exp. Sta.)

Pre-emergence and emergence weed control results with G-27901, G-30028, and G-30031 in snap beans, lima beans, and sweet corn. Alban, E. K., and Brubaker, K. K. Geigy experimental herbicides G-27901 (2-chloro-4-diethylamino-6-ethylamino-s-triazine), G-30028 (2-chloro-4,6-bis-(isopropylamino)-s-triazine), and G-30031 (2-chloro-4-diethylamino-6-isopropylamino-s-triazine) were used in 17 pre-emergence and emergence weed control trials during the summer of 1957. Plot size was two 30-foot rows replicated five times. Growth and yield were observed for evidence of crop damage. Results: G-27901 applied at emergence severely damaged snap beans at both 2.0 and 4.0 lbs/A rates in two trials. G-27901 did not damage lima beans at 4.0 lbs/A in one trial, nor sweet corn at the same rate in two trials. Control of Amaranthus retroflexus was very good in all tests. Too few grasses and Portulaca oleracea were present in most trials to rate control. In two plots grass and Portulaca control were good. G-30028 at 1.0 lb/A emergence severely damaged snap beans in one trial. Lima beans were temporarily stunted by 2.0 lbs/A pre-emergence, and severely injured by 4.0 lbs/A pre-emergence. Sweet corn was not damaged by 2.0 and 4.0 lbs/A pre-emergence applications of G-30028. Grass control was generally fair three weeks after treatment, while control of Amaranthus and Portulaca was very good in the same period, remaining good for a six-week period in half of the tests. G-30031 at 1.0 and 2.0 lbs/A emergence rates slightly and severely damaged snap beans respectively. Two lbs/A pre-emergence did not injure lima beans in one trial. Sweet corn was not damaged by one 2.0 lbs/A emergence or two 4.0 lbs/A pre-emergence treatments of G-30031. Control of grasses following application of G-30031 was only fair three weeks after treatment in all trials, while control of Amaranthus and Portulaca was very good. After six weeks plots were quite grassy. (Ohio Agr. Exp. Sta.)

Weed control in sweet corn with Simazin, 1956-1957. Alban, E. K., and Brubaker, K. K. Sweet corn was treated with pre-emergence and emergence applications of Simazin (2-chloro-4,6-bis-(ethylamino)-s-triazine) in four tests in both 1956 and 1957. In 1956 plots were seeded June 8, 21, and 27 with Golden Cross Bantam; in 1957 plots were planted June 13, 21, and July 1, both Golden Cross Bantam and Golden Security varieties being seeded. Plot size was two 20-foot rows replicated five times in 1956, and two 30-foot rows replicated five times in 1957. Soil was Miami and Brookston silt loam. Two lbs/A of Simazin in all tests except one (1.0 lb/A) was applied 4 or 5 days after planting with a plot sprayer. Weed control was evaluated visually for dominant weed species (Setaria sp., Digitaria sp. Amaranthus retroflexus, and Portulaca oleracea) at intervals of three and six weeks after treatment. Ears were harvested when mature, counted, and weighed. Results: Simazin gave good to excellent control of all dominant species three weeks after treatment in all 1956 tests. In these same tests weed control was still good in three of the four treatments six weeks after application. Crop vigor and yield were also good. In 1957 Simazin application resulted in good to excellent control of weeds in the two plots which were treated in June, but weed control was only fair in those plots treated on July 7. Rainfall was appreciably lower in July than in June, although sufficient soil moisture for the crop was maintained by irrigation. Portulaca was the dominant weed present in the July 7 treatment plots six weeks after application. Crop vigor and yield were good in all tests. (Ohio Agr. Exp. Sta.)

Post-emergence weed control results with G-30028 and G-30031 in sweet corn. Alban, E. K., and Brubaker, K. K. G-30028 (2-chloro-4,6-bis-(isopropylamino)-s-triazine) and G-30031 (2-chloro-4-diethylamino-6-isopropylamino-s-triazine) at 8.0 lbs/A post-emergence were each used in two trials, one on Golden Cross Bantam and one on Golden Security sweet corn. Plot size was two 30-foot rows replicated three times. Spray was directed at the base of the 12-inch high plants. Weeds at time of treatment were 6 to 8 inches high and numerous. Results: Growth and yield of corn were not significantly affected by either G-30028 or G-30031. Vigorously growing weeds were very satisfactorily controlled with G-30031, control of Amaranthus retroflexus and Portulaca oleracea three weeks after application being very good, while control of grasses was fair. Control with G-30031 was superior to that with G-30028, while both G-30028 and G-30031 were much superior to 12.0 lbs/A of Simazin which had been applied at the same time. (Ohio Agricultural Experiment Station)

Pre-emergence herbicide treatments on beans. Brink, K. M. and Warren, G. F. Contender snap beans and Thorogreen lima beans were planted on June 17 in a silt loam soil in six replication randomized block experiments. Sprays were applied on June 18 for snap beans, and the following day for lima beans at a rate of 100 gal/A. The following treatments expressed in pounds of active ingredient per acre were applied: Simazin (2-chloro-4,6-bis-(ethylamino)-s-triazine) 1, 2 and 4 lbs/A; G-30044 (2-methoxy-4, 6-bis (ethylamino)-s-triazine) 2 and 4 lb; G-30451 (2-chloro--4-propylamino-6-isopropylamino-s-triazine) 4 and 8 lb; G-27901 (2-chloro-4-ethylamino-6-diethylamino-s-triazine) 4 and 8 lb; G-30028 (2-chloro-4, 6-bis-(isopropylamino)-s-triazine) 4 and 8 lb; G-30031 (2-chloro-4-diethylamino-6-isopropylamino-s-triazine) 4 and 8 lb; neburon, 2 lb; CDAA, 6 lb; CIPC, 8 lb; EPTC (ethyl N, N-di-n-propylthiolcarbamate) 6 and 12 lb; and the amine salt of DNBP, 9 lb. Precipitation of .45 inches fell between June 18 when snap beans were sprayed and June 19 when lima beans were sprayed. There was a total of 3.03 inches of precipitation for a period of two weeks following June 19. Results presented with regard to weed control and plant tolerance are a summary of observations made from time of seedling emergence until the ultimate death or maturity of the plant material was reached. All the triazine compounds gave good weed control at the 4 lb rate, with the exception of G-30044 which appeared weak at this rate. Simazin gave excellent control at the 1 lb rate. Neburon and CDAA gave only fair weed control while CIPC and DNBP gave good control. EPTC gave fair to good weed control at 6 lb and good control at 12 lb. The predominant weeds present in the test were crabgrass (Digitaria spp.), carpetweed (Mollugo verticillata), velvet leaf (Abutilon theophrasti) and wild morning glory (Ipomoea spp.). With respect to crop injury to both lima and snap beans, Simazin, G-30451, G-27901, G-30028 and G-30031 all showed severe injury to plants at all rates while G-30044 showed little injury even at the 4 lb rate. Neburon, CIPC and DNBP exhibited little if any plant injury and EPTC showed no injury even at the 12 lb rate. CDAA showed some early damage which later was not evident. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Pre-emergence and emergence weed control in lima beans, snap beans, and sweet corn with Geigy 444. Brubaker, K. K., and Alban, E. K. Geigy 444 (2-chloro-4, 6-bis-(diethylamino)-s-triazine) was used in 20 weed control field trials during the summer seasons of 1956 and 1957. Crops treated were lima beans (Fordhook 242), snap beans (Tendergreen), and sweet corn (Golden Cross Bantam). All treatments were made just before emergence or at emergence of crops. Size of plots in 1956 was two 20-foot rows, replicated eight times; in 1957 size of plots was two 30-foot rows, replicated five times. Control of grasses (Digitaria sp. and Setaria sp.), Amaranthus retroflexus, and Portulaca oleracea was estimated visually three and six weeks after treatment by comparison with unweeded check plots. Plots

in which weed control was poor were weeded. Results: Growth and yield of snap beans were slightly to severely damaged by Geigy 444, usually severely, in all trials. Lima beans and sweet corn were not damaged. Control of broadleaf weeds was generally very good, while control of grasses ranged from poor to good, usually fair. In general, 6.0 and 8.0 lbs/A of Geigy 444 gave better weed control than 3.0 and 4.0 lbs/A. Time of treatment, whether pre-emergence or emergence, did not seem to be related to effectiveness of weed control. (Ohio Agricultural Experiment Station).

Pre-emergence and emergence weed control in lima beans, snap beans, and sweet corn with Randox. Brubaker, K. K., and Alban, E. K. Randox (2-chloro-N, N-diallylacetamide) was used in a total of 24 weed control field trials in lima beans (Fordhook 242), snap beans (Tendergreen), and sweet corn (Golden Cross Bantam) during the summer seasons of 1955, 1956, and 1957. Size of plots varied from two 20-foot to two 30-foot rows, and number of replications from 5 to 8. Randox was applied as pre-emergence and emergence treatments of from 4.0 to 8.0 lbs/A. Results: Randox failed to give satisfactory control of broadleaf weeds in all 14 of the 1955 trials, and in all 4 of the 1956 trials. Good control of grasses resulted in only 3 of the 1955 trials and 2 of the 1956 trials. In the 1957 tests, all six treatments (all at 6.0 lbs/A Randox) gave good control of grasses three weeks after treatment. Control of Portulaca oleracea was fair, and Amaranthus retroflexus good in the same period. All 1957 plots required weeding about a month after treatment. Growth and yield of lima beans, snap beans, and sweet corn were not injured by any treatment throughout the three seasons. (Ohio Agricultural Experiment Station.)

Pre-emergence weed control in snap beans. Hemphill, D. D. Replicated, randomized 25 ft. plots of snap beans, Contender var., were treated pre-emergence with the following chemicals: CDEC 6 lb/A, Premerge 4 lb/A, EPTC 6 lb/A, Simazin 1 lb/A and Simazin related compounds G-27901 2 lb/A, G-30028 2 lb/A, G-30031 2 lb/A and G-30044 2 lb/A. EPTC, Simazin and all Simazin related compounds caused severe injury and reduced stand and yields. All plants were killed in G-30028 plots. Average yields in pounds per plot were as follows: Control 14.0, CDEC 30.2, Premerge 29.3, Simazin 3.6, G-27901 5.5, EPTC 6.3, G-30028 0.0, G-30031 0.5, and G-30044 15.8. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Pre-emergence weed control in bush beans grown on muck soil, 1957. Nylund, R. E., Nelson, D. H., and Dinkel, D. R. Topcrop bush beans seeded in muck soil on May 2, were sprayed on May 6, prior to bean emergence, with the following herbicides: 1.6 lb monuron, 4 lb. CDAA, 6 lb DNBP amine, 2.5 and 5 lb ethyl-N, N-di-n-propylthiocarbamate (EPTC), 4 and 6 lb C. P.-6936, 6 and 9 lb 3,4-dimethylbenzophenone (3,4-DMB), 0.8 lb monuron plus 4 lb CDAA, and 0.8 lb monuron plus 6 lb DNBP amine. Each herbicide was applied at 30 psi pressure in 80 gal. water per acre to 18' single-row plots replicated five times. The temperature on the application date was 74° F. and the soil surface was dry but the subsoil was moist. Temperatures during the week following herbicide application averaged 62° F. Following herbicide application, no rainfall until the 6th day when 0.16" was recorded. On the 8th day, 1.45" of rain was recorded. Weeds which emerged mostly after application included Setaria spp., Echinochloa crusgalli, Polygonum pennsylvanicum, Capsella bursa-pastoris, Amaranthus retroflexus, Chenopodium album, and Portulaca oleracea. Weed control and bean injury ratings were recorded three weeks after spraying. Inasmuch as none of the herbicides visibly injured the bean plants, no yield data were taken. The following herbicides gave some control of weeds: 1.6 lb monuron, 6 lb DNBP amine, 6 lb C.P.-6936,

lb 3,4-DMB, and the mixtures monuron plus CDAA and monuron plus DNBP amine. Of these, only 6 lb DNBP amine, and the two mixtures of herbicides gave commercially satisfactory control. (Paper No. 3836 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Pre-Emergence weed control in sweet corn. Warren, G. F. Seneca Chief sweet corn was planted by hand 1 to 2 inches deep on May 2 in a fine sandy soil. The next day the following herbicides were applied in 100 gal of water per acre: neburon, 2, 4 and 8 lb/A; CDEC, 4 and 8 lb; EPTC (ethyl N, N-di-n-propylthiolcarbamate), 4, 8 and 12 lb; Simazin (2-chloro-4, 6-bis-(ethylamino)-s-triazine), 1/2, 1, 2 and 4 lb; G-27901 (2-chloro-4-ethylamino-6-diethylamino-s-triazine), 4 lb; G-30028 (2-chloro-4, 6-bis-(isopropylamino)-s-triazine), 4 lb; G-30031 (2-chloro-4-diethylamino-6-isopropylamino-s-triazine), 4 lb; G-30044 (2-methoxy-4, 6-bis-(ethylamino)-s-triazine), 4 lb; and G-30451 (2-chloro-4-propylamino-6-isopropylamino-s-triazine), 4 lb. The surface 2 inches of soil was dry when the treatments were applied and there was no rain for the next 5 days, however, 9.10 inches fell in the following 17 day period. Treatments were replicated 6 times. Counts of crabgrass (Digitaria sanguinalis) made June 6 showed 87 to 100% control for neburon at 2, 4 and 8 lb, Simazin at 4 lb and G-30044. Control ranged from 52 to 72% for EPTC at 8 and 12 lb, Simazin at 1 and 2 lb, G-30029 and G-30451. All other treatments gave less than 50% control. The other weed present in considerable numbers was carpetweed (Mollugo verticillata). EPTC and CDEC at all rates gave no control of this weed. All other treatments gave over 95% kill except the 1/2 and 1 lb rates of Simazin which killed 46 and 75% respectively. Neburon at 4 lb and G-39944 caused considerable injury and reduced yields of sweet corn while neburon at 8 lb killed or severely injured all the corn plants. The other treatments had little or no effect on the sweet corn and the yields were not reduced when compared with the hoed and cultivated check. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Celery

Chemical weed control in celery. Waywell, C. G. Single row plots 15 ft. long of Utah (Salt Lake) celery seedlings were treated with the chemicals listed below using an over-all spray. The plot design was that of a simple randomized block with three replicates. At the time of treatment (21 June, 1957) the weeds and celery were about 2" high. On the 28th of June the weeds on a 12" strip centered on each row were pulled and weighed. Weed population consisted of oak-leaved goosefoot, lamb's quarters, groundsel, and purslane.

Treatment	Oz/A	Wt. weeds % Check	Treatment	Oz/A	Wt. weeds % check
1. Niagara 5562	16	32	6. MCP Butyric Ester	16	56
2. Niagara 5562	48	23	7. MCP Butyric Ester	24	54
3. 2,4-D Butyric Ester	16	36	8. MCP Butyric-Sodium	24	39
4. 2,4-D Butyric Ester	24	33	9. MCP Butyric-Sodium	32	31
5. 2,4-D Butyric-Sodium	24	64	10. Check	--	100

All treatments reduced weed growth with N5562, 2,4-D Butyric Ester, and MCP Butyric Sodium causing the greatest reduction. Rapid weed growth and a limited amount of labour made early weeding of the plot area necessary. Treatments 4, 7, and 9 caused some epinasty in the leaves which were exposed at the time of treatment. Leaves produced later were normal. No differences in the plots could be detected through August and September. On the 2nd of October all plants in three feet of

row were pulled, trimmed, and sliced through the centre. No abnormalities were found. Ten feet of each plot was harvested and weighed. The differences in weight were not statistically significant. (Department of Botany, Ontario Agricultural College, Guelph, Canada).

Chemical weed control in transplanted celery. Waywell, C. G. Single row plots 15 ft. long of Utah (Salt Lake) celery transplanted on August 1st were treated with an over-all spray three weeks after "setting out". Chemicals used were Niagara 5562 at 16 and 48 oz/A, 2,4-DB Ester at 16 and 24 oz/A, 2,4-D Sodium at 24 oz/A, MCPB Ester at 16 and 24 oz/A, and MCPB Sodium at 24 and 32 oz/A. The plot design was a simple randomized block with six replicates. On 11 October all plants in three feet of row were pulled and examined. No abnormalities were found. The remainder of each plot was harvested and weighed. Under the conditions of the experiment the yield differences were not statistically significant. (Department of Botany, Ontario Agricultural College, Guelph, Canada).

Tomatoes

Effect of 2,4-D on tomatoes. Dabbs, D. H. and Forsberg, D. E. This trial, which was conducted in 1956, was repeated in 1957 in an effort to obtain more factual information. Early Chatham tomato plants, growing in 5 inch clay pots, were subjected to a spray of 2,4-D ester on June 14. The plants were approximately 6 inches in height and some were beginning to show the first bloom. The potted plants were arranged in the field at distances of 0, 2, 4, 12, 24, 48 and 96 rods downwind from the path of the field sprayer. A check treatment was also included. The wind speed was 13-15 mph. and the sprayer was operated for thrity minutes at an application rate of 5 oz acid/A. The plants were transplanted into the garden on June 15. The statistical treatment used was a randomized block design with four replications. The experimental unit consisted of three plants. Table 1 shows the effects on yields for 1956 and 1957.

Table 1. Yields of fruit (in pounds) from tomatoes subjected to 2,4-D drift.

Treatment	Ripe Fruit (Ave. yield/Rep.)		Green Fruit (Ave. yield/Rep.)		Total Yield of Fruit (Ave. yield/Rep.)	
	1956	1957	1956	1957	1956	1957
0-rods	0.4	0.0	1.1	0.0	1.4	0.0
2-rods	1.7	0.1	2.2	0.2	3.9	0.2
4-rods	1.7	0.1	3.1	1.4	4.7	1.4
12-rods	1.9	0.9	2.4	4.9	4.7	5.7
24-rods	1.6	2.6	2.6	8.1	4.2	10.7
48-rods	2.1	3.6	2.7	6.4	4.7	10.0
96-rods	1.7	3.2	2.1	5.7	3.8	8.9
Check	1.8	2.5	2.2	2.8	4.0	5.3

1956 - ripe - L. S. D. 5% = 0.71 lbs; Total - L. S. D. 5% = 1.45 lbs.
1957 - ripe - L. S. D. 5% = 0.84 lbs; Green - L. S. D. 5% = 2.93 lbs.
Total - L. S. D. 5% = 3.21 lbs.

In 1956, fruit was set earlier and early growth of fruit was more rapid on plants from the 2, 4 and 12 rods treatments particularly than from the check treatment. All plants from the 0 rods treatment were severely distorted for the first three weeks. Following this date, recovery was quite good for replicates 1 and 3. Most of the field ripened fruit from the five treatments closest to the path of the

sprayer were seedless and the skin over the entire stem end was severely russeted and often badly cracked. The adverse effects of the 2,4-D on the 0, 2, 4 and to some extent the 12-rod treatments, was considerably more pronounced in 1957 than it was in 1956. In 1957, all plants within 4 rods of the sprayer were essentially ruined. The increased yield at the 24, 48 and 96 rod distances in 1957 was interesting. There seemed to be a definite stimulating effect due to the light concentration of 2,4-D fumes, and most of these fruit were seedless, or nearly so. The russeting and skin cracking was not so severe in 1957 as it was in 1956. (Experimental Farm, Scott, Saskatchewan, Canada).

Chemical weed control in transplanted tomatoes. Hemphill, D. D. Following chemicals were applied as an overall spray on tomatoes one week after transplanting: CDEC 6 lb/A, Simazin 2 lb/A, Simazin 1 lb/A and Simazin related compounds G-27901 2 lb/A, G-30028 2 lb/A, G-30031 2 lb/A and G-30044 2 lb/A. Simazin 2 lb/A and G-30031 2 lb/A caused chlorosis and stunting of the tomato plants. Weed control was inadequate in Simazin 1 lb/A and CDEC plots. Average yields per plot were as follows: Control 97.8 lb, CDEC 6 lb/A 108.9 lb, Simazin 2 lb/A 96.6, Simazin 1 lb/A 109.8 lb, G-27901 2 lb/A 119.44 lb, G-30028 2 lb/A 112.2 lb, G-30031 2 lb/A 60.8 lb, G-30044 2 lb/A 111.2 lb. (Department of Horticulture, Missouri Agricultural Experiment Station, Columbia, Missouri).

Other Crops

Effectiveness of Randox in relation to timing and soil moisture. Brubaker, K. K., and Alban, E. K. Rutgers tomato plants were treated two weeks after transplanting with directed post-emergence applications of 6.0 lb/A of Randox (2-chloro-N, N-diallylacetamide) prior to weed emergence in all combinations of three different times of application with four soil moisture conditions. Plots contained ten tomato plants and were randomly replicated four times. Soil moisture was adjusted by means of supplemental overhead irrigation in conjunction with natural rainfall. In several instances the number of weed seedlings present in the uppermost inch of soil was counted. After one month the complete procedure was repeated on the same plots, after removal of weeds which were present. The first experiment was begun in June, 1956, and the second in July, 1956. In the June experiment, time of application of Randox was 1, 2, and 3 days after final cultivation. Each of these timing schemes was conducted under four different soil moisture conditions: 1. moist before and after treatment, 2. moist before treatment only, 3. moist after treatment only, and 4. relatively dry both before and after treatment. In the July experiment, time of application of Randox was 3, 7, and 9 days after final cultivation. Soil moisture conditions were relatively the same as before. Weed control ratings were made approximately three weeks after the last cultivation. All ratings were based on the unweeded check treatments. Results: In both experiments the number and vigor of weeds in check plots varied greatly between moisture conditions. The best control of both broadleaf weeds and grasses, which in no case was very satisfactory, occurred when Randox was applied 2 to 7 days after cultivation where relatively dry soil conditions prevailed previous to treatment. Under moist soil conditions previous to treatment, Randox tended to control only grasses, evidently because broadleaf weeds germinated too quickly and became resistant to herbicidal action of Randox. Samples of soil indicated that weed seedlings developed much more rapidly under moist soil conditions, and that broadleaf weeds developed more rapidly than grasses, or at least in greater numbers, under moist conditions. It is possible that poor broadleaf weed control under moist conditions may have been associated with the more rapid development of these weeds, while better control, especially of Portulaca, in the plots which were relatively dry previous to treatment may have been due to a later

period of broadleaf weed seed germination. It appeared therefore that Randox was effective as a herbicide only during a very critical period, possibly only when the chemical contacts germinating seeds, and that certain broadleaf weed seedlings quickly become resistant to Randox. (Ohio Agricultural Experiment Station).

Varietal response of pickling cucumbers to NPA. Freeman, J. A. and Magel, H. A. The prime purpose of this experiment was to study the varietal response of pickling cucumbers to NPA (Alanap-3). Seed was sown June 20, 1957, on a Monroe silt loam. Varieties included Yorkstate, Chicago, Ohio MR 17, Snows, National and Packer. The following pre-emergence treatments were applied June 28: NPA at 4, 6 and 12 lb/A. A further two plots in each replicate were treated as follows: NPA at 6 lb/A pre-emergence followed by 4 and 6 lb/A post-emergence. An additional plot in each replicate received only a post-emergence treatment of NPA 6 lb/A. Post-emergence sprays were applied July 19 when temperature was 82° F. All varieties had developed their second pair of true leaves. All treatments were applied with a power sprayer at the rate of 40 gal/A and 40 psi. Moisture conditions were ideal throughout the growing season with excellent crop yields recorded. Weed control was satisfactory for all treatments the lower rates giving 75-80% control and higher rates 90%. Horsetail (Equisetum arvense) was stunted and twisted by all treatments but plants slowly recovered. Weed growth was dense and marketable yield extremely low in the unweeded check plots. In comparison with the cultivated (weeded) check, no significant yield reduction occurred for any variety sprayed with NPA. This season Packer showed no adverse effect from the NPA rates applied. In 1956 the season was very dry and Packer proved least tolerant of the six varieties grown, all treatments reducing its yield significantly. (Canada Experimental Farm, Agassiz, B. C.).

Effect of pre-emergence herbicides on weed growth in an established asparagus planting. Swtizer, Clayton M. Several herbicides were applied April 25, 1957 to an established asparagus planting on the farm of Smart Brothers, Collingwood, Ontario. The plots were 75 feet long by 3 feet and were replicated 3 times. Sprays were applied by means of a knapsack sprayer at the rate of 100 gal/A. The field had been disced April 22, and no weeds or asparagus had emerged by the day of treatment. The soil was wet following a heavy rainfall (0.5 in.) April 24 and the temperature was 79°. Treatments included CMU (2), ATA (2), CMU + ATA (1+1), Alanap-3 (4 & 6), 2,4-D ester (1.5), and EPTC (6 & 10). Figures in brackets are lbs. active material per A. Excellent weed control (over 90% reduction in weed stand) was obtained in the plots treated with CMU, ATA and the mixture of these two. Alanap-3 gave 75-85% reduction in weed stand, 2,4-D 50% reduction and EPTC had no effect. None of the herbicides tested had any apparent effect on the asparagus. (Department of Botany, Ontario Agricultural College, Guelph, Canada).

Pre-emergence weed control in peppermint. Warren, G. F. and Erickson, H. T. Peppermint stolens planted 2 to 3 inches deep in muck soil on April 26 were sprayed May 7 (before emergence of mint) with the following herbicides: CDAA 4, 8 and 12 lb/A; Simazin (2 chloro-4, 6-bis-(ethylamino)-s-triazine), 4, 8 and 12 lb; a mixture of the amine salt of DNBP, 9 lb with CIPC, 6 lb. The spray volume was 50 gal/A and the pressure 26 psi. Treatments were replicated 4 times. During the next two weeks there were 2.27 inches of rainfall occurring as almost daily showers. Weed control was good with the mixture of DNBP and CIPC as well as with all rates of Simazin. CDAA at 4 lb gave poor control of pigweed (Amaranthus retroflexus), purslane (Portulaca oleraceae) and smartweed, (Polygonum spp). At 8 and 12 lb it gave fairly good weed control except for smartweed. Simazin caused injury to the mint which varied from slight at 4 lb to severe at 12 lb. CDAA caused injury at 4 lb and severe injury at 8 and 12 lb but there was considerable recovery as the

. . .

season progressed. Oil yields were reduced slightly but not significantly by 4 lb of either CDAA or Simazin. At 8 and 12 lb both of these herbicides significantly reduced the yield with Simazin causing the greatest reductions. The mixture of DNBP and CIPC caused no apparent injury to the mint and the oil yield with this treatment was slightly higher than the hand weeded check. (Department of Horticulture, Purdue University, Agricultural Experiment Station, Lafayette, Indiana).

Seed bed treatment with Mylone. Waywell, C. G. On 10 June, 1957 Mylone 85W (3,5-dimethyl tetrahydro - 1, 3-5, 2H thiadrazine-2-thione) was applied to 10 x 20 ft plots on muck soil at Bradford, Ont. Application was made with a watering can using 2 gal of water per plot at 100, 200, and 300 lb/A of product. The design used was that of a simple randomized block with 3 replicates. All plots were cultivated with a Rotospader to a depth of 5 inches, raked, and watered by sprinkler irrigation for 10 hrs. Plots were seeded with onions, cabbage, tomatoes, and celery at 9, 14, and 17 days after treatment. Readings on 24 July showed that all treated plots had less than 5% ground cover weeds. Average cover was Check - 100%, 100 lbs - 4%, 200 lbs - 2%, 300 lbs - less than 2%. Weeds present in check included purslane, oak-leaved goosefoot, lamb's quarters, groundsel, and red-root pigweed. The first seeding of cabbage on 300 lb/A plots appeared yellowish green for a short time and then recovered. All plants thereafter were normal with some stimulation to growth in the treated plots in direct proportion to the increased rate of chemical. (Department of Botany, Ontario Agricultural College, Guelph, Canada).

FRUITS

Summary

D. D. Hemphill

Apples. Poison ivy, horse nettle (Solanum carolinense), Kentucky bluegrass and many perennial weeds were effectively controlled beneath the limb-spread of bearing apple trees by Amino triazole. 2,3,6 TBA (2,3,6 trichlorobenzoic acid) gave poor control of horse nettle and bluegrass and caused severe apple leaf-modification the following spring.

Strawberries. Several relatively new herbicides were compared with 2,4-DES for weed control in strawberries. Simazin and related compounds G27901 and G30024 caused severe injury at rates of 2 lb/A and higher. Emid (2,4-dichlorophenoxyacetamide) and EPTC (Ethyl N,N-dipropylthiolcarbamate) failed to give satisfactory weed control. Natrin (2,4,5-TES) Neburon and 3Y9 (tris-2,4-dichlorophenoxyethyl phosphite) gave good weed control without injury.

Abstracts

Crabgrass control in established strawberry plantings. Campbell, R. W. A number of chemicals were applied as residual pre-emergence sprays to established Blakemore strawberry plants to test their effectiveness in the control of common crabgrass. The effects of the chemicals on the strawberry plants were also studied. Chemicals used included Emid, neburon, sesone, 3Y9, Simazin and Geigy 27901. Applications of Emid and sesone did not prove effective. All of the other chemicals showed good control of common crabgrass. Simazin at 2 pounds per acre produced considerable damage to the strawberry plants while 1 pound applications did not cause injury. (Contribution of Department of Horticulture, Kansas Agricultural Experiment Station).

Control of vegetation under bearing apple trees. Hemphill, D. D. Poison ivy, horse nettle (Solanum carolinense), brambles and many other perennial weeds and grasses thrive beneath the limb-spread of bearing apple trees. These plants create a nuisance and a health hazard for the pickers, compete with the tree for moisture and nutrients and provide cover for trunk girdling mice.

2,4-D and 2,4,5-T gave good control of poison ivy and many other weeds, but are ineffective in the control of horse nettle and grasses. To control 2,4-D resistant species Amino triazole 2 lb/100 gal. water and 2,3,6-TBA 3 lb/100 gal. water were applied as wetting sprays to mixed vegetation beneath bearing trees on August 1, 1956.

2,3,6-TBA gave poor control of horse nettle and grasses and caused severe apple leaf modification in the first flush of growth in the spring of 1957. Later leaf growth was normal but considerable injury to the trees had resulted.

Amino triazole gave rapid kill of ivy, horse nettle, most perennial weeds and all grasses except Nimblewill (Muhlenbergia schreberi) with little regrowth in 1957. (Contribution of Department of Horticulture, Missouri Agricultural Experiment Station).

Chemical weed control in strawberries. Herron, J. W. and Chaplin, C. E. Treatments with SES 3 and 6 lb/A, New Process SES 3 and 6 lb/A, Natrin 80S 3 and 6 lb/A, EPTC (Ethyl N, N-di-n-propylthiolcarbamate)-3, 6, 12 lb/A, Simazin (2-chloro-4, 6-bis (ethylamino)-S-triazine) 2, 4, 8 lb/A active and related chemicals G27901 and G30028 each at 2, 4, 8 lb/A active ingredient, were made on Tennessee Beauty strawberry plants. The first applications were made 14 days following planting on April 5, 1957. Subsequent treatments were made with SES, New Process SES,

Natrin 80S or EPTC plots. Satisfactory weed control was obtained with all materials except EPTC. No difference in rooting of runners was noted between treated and untreated plots. This was probably due to extreme drought conditions.

Simazin, G27901 and G30028 at low rates caused severe injury to strawberry plants. Complete kill resulted from the high rates of these chemicals. (Contribution of Department of Horticulture, Kentucky Agricultural Experiment Station).

Ornamental Nurseries, Forest Nurseries, Shelterbelts, and All Others

J. P. Mahlstede

Summary

Reports concerned with the control of herbaceous weeds and grass in ornamental nurseries, forest plantings, and tobacco transplant beds were received from six stations.

Amino triazole (2 and 3#/A) applied 45 days after emergence gave excellent weed control. At 2#/A no injury was observed on spruce, Jack pine and Balsam fir, although red, white, and Scotch pines and white cedar showed extensive damage. When applied to 2 and 3 year-old spruce and pine seedlings in transplant beds, no injury was noted by a 1#/A application.

Directed sprays of MH 30 applied at .5 and .75 per cent concentrations stopped or retarded weed growth for six weeks when applied to young weeds in the nursery row early in the season.

2,4-D esters are more rapidly injurious than 2,4,5-T esters to Douglas fir and Lodgepole pine. M.H. at 50ppm caused inhibition of pine shoots three weeks after application.

Soil moisture conditions and timing are apparently quite important in determining the success or failure of certain herbicides used as drench applications.

Neburon (2 and 4#/A) and Simazin (2 and 4#/A) gave excellent weed control with no injury to potted transplants of Taxus media hicksi. Bare-root, three year old liners of Sugar maple, were not injured by the application of Simazin at the rates of 4 and 8#/A one month after transplanting. Excellent weed control was realized for the entire growing period.

Direct seeded hollyhocks were quite sensitive to the application of pre-emergence herbicides. Shasta daisy and Anemone transplanted with a "soil ball" were not injured by applications of 2,4-DES, NP 20-G, or Simazin at low concentrations. Bare-root transplants of Rhamnus cathartica were injured by the application of Simazin (4#/A), although weed control was excellent. Herbicides used in granular form generally gave differential weed control principally because of distribution problems.

Abstracts

Effect of Amino Triazole on various coniferous seedlings. Blanchard, K. L., Hall, John, and Anderson, Roy B. Amino Triazole at 1, 2 and 3 lb/A active was applied on duplicate one-half sq. rod bed areas, to eight species of coniferous seedlings, approximately 45 days after emergence. Species used were: (1) Black spruce (2) white spruce (3) red pine (4) Scotch pine (5) Jack pine (6) white pine (7) balsam, and (8) white cedar. Chemical applied in water solution at 40 gal/A on July 9, 1957, at General Andrews Forest Nursery, Willow River, Minnesota. Observations were taken at 2-week intervals for two months following application. Results: 1 lb rate produced no injury on (1), (2), (3), (5), (7), and (8), but (4) and (6) showed extensive whitening of terminal growth areas. 2 lb rate produced no injury on (1), (2), (5) and (7), but extensive injury on (3), (4), (6) and (8). 3 lb rate produced less than 5% injury to (2) and (7), but severe damage to all other species, with subsequent

necrosis of the affected plant areas. Annual grass and broadleaf control was good at 1 lb rate, and excellent at 2 and 3 lb rates. (Minnesota Department of Agriculture and Division of Forestry, Minnesota Department of Conservation.)

Effect of Amino Triazole on various 2 and 3 year Conifers. Blanchard, K. L., Hall, John, and Anderson, Roy B. Amino Triazole at 1 and 2 lb/A active was applied on duplicate one-half sq. rod bed areas, to three species of 2 and 3 year old conifers. Species used were: (1) white spruce, (2) black spruce and (3) red pine. Chemical applied in water solution at 40 gal/A on August 21, 1957, at General Andrews Forest Nursery, Willow River, Minn. Observations were taken at 2 week intervals for two months following application. Results: 1 lb rate on 2 and 3 year plants produced no injury on any species. 2 lb rate on 2 year plants produced no injury on (1) and (2), and less than 10% whitening of tip areas on (3), and this only on smaller plants. 2 lb rate on 3 year plants produced no injury on (1) and (2); 50% of plants of (3) showed slight whitening on lower portions of terminal needles. (Minnesota Department of Agriculture and Division of Forestry, Minnesota Department of Conservation.)

Spring Weed Control in the Nursery with Maleic Hydrazide. Chadwick, L. C. and James, Bryson L. A directed spray of maleic hydrazide, derived from diethanolamine salt (MH 30), was applied to young weeds in a nursery on March 30 to inhibit their early spring growth. Three treatments, 0.0. (check), 0.5, and 0.75 percent maleic hydrazide were replicated three times in each of six different locations. Prevalence of weeds at time of treatment varies from complete coverage to less than 10 percent in different plots. Sprays were applied with a 5 gallon Indian knapsack sprayer fitted with a 9003 T-jet nozzle. A 10-inch funnel around the nozzle directed the spray onto the ground and minimized drift to the nursery crop. The temperature varied from 40° to 50° F. at the time of application. After application, a rain-free period of 36 hours was followed by two weeks of cold rainy weather. Visual observations were made at two-week intervals. After the first two weeks there was no noticeable weed growth in either the treated or untreated plots, but after four and six weeks it was clearly evident that both concentrations of MH had stopped or severely retarded growth of most of the weeds treated. Observations were terminated after six weeks. The chemical was especially effective for controlling chickweed, rye, poor man's weather-glass, and wild oats. Quack grass which was 3-4 inches when treated was only 4-6 inches after six weeks, compared with a height of 12 inches in check plots. Since there was no noticeable difference in the plots treated with 0.5 and 0.75 percent maleic hydrazide, and judging from reports of other workers, it is suggested that lower concentrations may be used effectively. (Ohio Agricultural Experiment Station, Wooster, Ohio.)

Comparison of various growth substances on seedlings of Douglas fir and lodgepole pine. Corns, Wm. G. Experiment I:- Seed of coastal and interior forms of Pseudotsuga menziesii, Pinus contorta and P. contorta latifolia planted in greenhouse beds of soil at Vancouver emerged uniformly within 2 weeks from planting. Average height of seedlings at time of treatments 2 months after planting was coastal fir 1.25", interior pine 1.0", interior fir 0.75", and coastal pine 0.65". Three replicates, each with 10 plants for each chemical, received these treatments: Dalapon (sodium salt); maleic hydrazide (sodium salt); neburon; 2,4-D (l.v. butoxy ethanol ester); 2,4-D (l.v. propylene glycol, butyl ether ester); 2,4,5-T (l.v. prop. glyc. but. ether ester); 2,4,5-T (l.v. ester); B-alanine (pure amino acid); gibberellin A-gibberellic acid; each prepared as emulsion with 1% active ingredient in clear mineral oil with Tritan B 1956 emulsifier. One drop (0.15 cc.) of mixture was applied to the apex of each plant within each treatment. Controls received only oil with emulsifier. The 2,4-D esters were more rapidly injurious than 2,4,5-T esters although apparently excessive amounts of both chemicals ultimately killed all plants. There

was differential response among species during the first month after treatments, viz. interior fir, coastal fir, interior pine, coastal pine in this order from most to least resistant to 2,4-D and 2,4,5-T. There was much less, though still appreciable, injury from dalapon, neburon and maleic hydrazide (arranged in decreasing order of toxicity). A trend similar to that noted above appeared for differential species response. B-alanine and the gibberellin mixture were without visible effect on the seedlings. Experiment II provided comparisons of effects on lodgepole pine seedlings of growth substances absorbed by the seed and roots in moist vermiculite in covered beakers. Chemicals and concentrations of active ingredient were: 2,4-D l.v. ester and 2,4,5-T l.v. ester, 0.01, 0.1, 1.0, 5.0, 10 ppm.; dalapon and neburon, 50, 200, 500 ppm.; maleic hydrazide, 10, 50, 200, 500 ppm.; B-alanine, 50, 100, 200 ppm.; gibberellin, 10, 50, 100, 200, 500 ppm.; controls, water only. With the 3 lower concentrations of 2,4-D and 2,4,5-T, the greater toxicity of 2,4-D was again apparent and again these 2 chemicals were greatly more toxic than the others tested. The lowest concentration of any of the other chemicals to cause visible inhibition of pine shoots during a 3 week period was 50 ppm. MH., Dalapon at 200 ppm. had slightly less effect than MH. at 50 ppm. Even at 500 ppm., neburon was without effect on the shoot growth. This may suggest possibilities for testing soil treatment for weed control among conifers. B-alanine had no visible effects on shoot growth. Gibberellen, at 10 and 50 ppm. had no effect; at 100 and 200 ppm. it caused temporary inhibition; at 500 ppm. there was definite stunting. Thus this substance failed to show stimulation of the coniferous species. (University of Alberta and University of British Columbia.)

Preseeding treatment of tobacco plant bed soils with herbicidal drenches for control of weeds. Freeman, J. F. Drench treatments of materials at rates shown below were made in fall and early spring in a randomized block design with 3 replications. Formulation rates/100 sq ft were for Fall beds 3.5-dimethyltetrahydro-1,3,-5, 2 H thiodiazine -2-thione (Mylone) as mylone 85 W 1/2 lb., 3/4 lb and 1 lb., and 3/4 lb 1 month later in fall; as mylone 80-D 3/4 lb; concentrate of Urea (25%)-Formaldehyde (60%) as UF conc. 85, 1 1/2 qt and 2 1/2 qt; as UF conc. biuret (in which approx. 1/2 the urea of UF conc. 85 is replaced by biuret) 2 qt; allyl alcohol (81%) / ethylene dibromide (11.5%) as Bedrench 1 qt; for Spring beds- Mylone 85W 1/2 lb. 3/4 lb, 1 lb; Mylone 80-D 3/4 lb; UF conc. 85 1½ qt, 2½ qt; UF conc. biuret 2 qt; Bedrench 1 qt; and no treatment. The chemical for each plot was applied in water 11 gal/100 sq ft to the freshly prepared soil except that Mylone 80-D was diluted with sand and spread evenly over the soil prior to water-drenching. For fall treatments additional drench water (5.5 gal/100 sq ft) was used, but the moist soil in spring treatments would absorb no more than the initial quantity. Fall beds were treated 10/20/56-soil temp 70°F. Spring beds were treated 3/11/57-soil temp day 62°F and night 44°F. During the interval between date of spring treatments and the seeding of all beds 3/30/57 light showers were frequent (total ppt 1.2 in). Tobacco emerged a good stand for all treatments and showed no phytotoxic effects from any of them. Weeds were pulled from each bed and number by species was determined. Later the number of transplantable tobacco plants at each of 3 pullings made at 1 week intervals and the number remaining were determined. Results were based on comparisons to the number of weeds in the check (84 weeds/sq ft). Approximately 90% control of weeds resulted from spring treatments with Mylone 85W at 3/4 and 1 lb, Mylone 80 D at 1 lb, and Bedrench at 1 qt; 85% control from fall treatments with Mylone 85 W at 3/4 lb (late fall), and Bedrench 1 qt; 80% control from Mylone 85 W at 1/2 lb treated either in fall or spring or 3/4 lb in fall; Other Mylone treatments in fall resulted in less than 80% weed control; and very poor control of weeds resulted from all the urea - formaldehyde treatments.

In a second experiment located near the first where similar treatments were made on spring prepared beds very poor weed control resulted. There the growth of soybeans and weeds was plowed under in the fall, as was true of the first experiment, the land seeded to small grain cover crop and the land replowed to 6" depth 2/22/57.

After fitting, the herbicidal drench treatments were applied 3/4/57 one week before the spring treatments were made in the first experiment. The soil temperature range in the 7 days following treatment was 55°-30°F with cloudy skies and ppt 0.86". Tobacco was seeded at about the same time as for the first experiment and good stand of plants resulted. Weed control was so inadequate for all drench treatments that experiment was abandoned following a token weed-count for each bed. One possible explanation of the poorer weed control obtained in this experiment is that the weed seeds turned to the surface in plowing 10 days prior to treatment were poorly preconditioned for germination and another is that relatively low soil temperatures prevailed during several days following treatment. (Agronomy Department, Kentucky Agricultural Experiment Station, Lexington, Kentucky.)

Control of weeds in beds of Taxus media hicksi and sugar maple plantings. Herron, J. W. Treatments with Monuron 2 and 4 lb/A actual, Simazin 2 and 4 lb/A active ingredient, SES 3 lb/A and New Process SES 3 lb/A were made in beds of Taxus media hicksi. Plot size was 81 sq. ft. with 2 replications of each treatment. Cuttings were taken December 1956, rooted, and then potted in March 1957. They were kept in cold frames until transplanted into beds on June 10, 1957. The first application of each chemical was made on June 27. Three additional treatments with SES and New Process SES were made on July 20, August 29, and September 20. One additional treatment was made with Neburon and Simazin on August 29. The beds were irrigated when necessary. Each plot was hand weeded prior to the application of chemicals. The residual effect of SES and New Process SES was from 3 to 4 weeks. Control with Simazin and Neburon was as follows:

	Per cent weed control*	
Treatment	3 wk. after treatment	8 wk. after treatment
Neburon 2 lb/A	90	74
Neburon 4 lb/A	94	72
Simazin 2 lb/A	99	58
Simazin 4 lb/A	100	81

* Based on weed counts per sq. ft.

Principal weeds controlled were Amaranthus sp, Digitaria sanguinalis, Mollugo verticillata, and Portulaca oleracea.

Growth of weeds, when present in the treated plots was greatly inhibited as compared to those in untreated plots. No injury to the crop plants was observed in any of the treated plots.

Simazin 4 and 8 lb/A active ingredient was applied on March 12, 1957 to 3-year-old sugar maple liners. The trees were transplanted February 10, 1957. Each plot was a row 2 ft. wide and125 ft. long. No additional weed control treatment was made throughout the growing season. Excellent weed control was noted on October 15, 1957. The 4 lb/A rate appeared to be as effective in controlling weeds as the 8 lb/A. On October 15, the check plots were heavily infested with weeds ranging from six inches to 5 feet in height. The majority of weeds in the check plots were: Chenopodium album, Amaranthus sp., Digitaria sanguinalis and Setaria sp.

No apparent injury to the maple trees was observed at any time during the growing season. (Department of Horticulture, Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Comparative study of the amount of labor required to control weeds in treated and untreated beds of Taxus cuspidata. Herron, J. W. This study was set up to obtain information concerning the comparative length of time required to hand weed treated and untreated beds of Taxus cuspidata. Three, 600 sq. ft. beds were chosen for the study. One was treated with SES 3 lb/A, one with New Process SES 3 lb/A,

and one was left untreated. Applications of the chemicals were made on June 27, July 20, August 20, and September 20, 1957. The same person did the weeding for the entire study. Each bed was weeded prior to the July 20, August 20, and September 20, treatments.

Results of this study indicate that in Taxus beds, chemical weed control may reduce the amount of hand labor for weeding by approximately 50 per cent.

Length of time for weeding is as follows:

Treatment	Minutes required to hand weed beds		
	July 20	August 20	September 20
SES	43	25	48
New Process SES	40	30	45
Untreated	100	60	105

(Department of Horticulture, Kentucky Agricultural Experiment Station, Lexington, Kentucky).

Control of weeds in direct seeded hollyhocks. Mahlstede, J. P., Mixed hollyhock seed was drilled in three foot rows at the rate of 16 seeds per foot of row on June 22, 1957. The following treatments were applied to replicated plots one (June 29), two (July 6), and three (July 13) weeks after seeding: 2,4-DES (4#/A), NP 20-G (5#/A), Simazin (2 and 4#/A), Simazin granular (2#/A), DNBP (2 qts./A) and CDAA granular (2#/A). Each plot was hand weeded immediately prior to the application of the herbicide. One week after seeding the hollyhocks had germinated and and the two cotyledonary leaves were fully expanded. At two weeks the plants were 2 inches high and the first two, true leaves were fully expanded. When chemicals were applied on July 13, three weeks after seeding, the hollyhocks were approximately 4 inches high and five leaves had unfolded. Weed control effectiveness was determined 30 days after herbicide application and was based on weed counts and density stand estimates. All chemicals utilized in this experiment caused some marginal leaf burning and leaf mottling, regardless of concentration or time of application. 2,4-DES, NP 20-G, CDAA granular and DNBP did not significantly reduce the stand of hollyhocks. Simazin at the 2#/A and 4#/A rates applied as a liquid, or at 2#/A applied as a granular significantly reduced field stands. Although Simazin (2#/A) liquid, applied three weeks after seeding allowed for 60 per cent stand of hollyhocks, only 70 per cent weed control was realized. Simazin applied at the 4#/A rate was the only chemical which gave consistently good weed control under the conditions of this experiment. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa.)

Control of weeds in perennial transplants. Mahlstede, J. P. Equal numbers of Shasta Daisy and Anemone, grown in Aero pots containing a mixture of peat and perlite were field planted in a Webster type soil on June 15, 1957. Replicated, weed free plots, 150 square feet in area were treated two weeks later with 2,4-DES (4#/A), NP 20-G (5#/A), Simazin (2#/A), Simazin granular (2#/A) and water. Weed control effectiveness, based on square foot feed counts and density estimates was determined on July 24, 2,4-DES resulted in 82 per cent weed control, Simazin 85 per cent weed control, Simazin granular 68 per cent, and NP 20-G 66 per cent control of such weeds as Setaria spp., Amaranthus spp., Chenopodium spp., and Portulaca spp.. All plots were watered regularly with overhead irrigation after application of the herbicides. Poor weed control from the granulars was attributed in part to poor distribution. No stand reduction was observed for any of the chemicals tested. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa.)

Chemical weed control in transplant beds. Mahlstede, J. P. Bare-root, 8-10" seedlings of Rhamnus cathartica were transplanted on August 20, 1957 into transplant beds containing a sandy-loam soil. Immediately after watering Simazin (4#/A), CDAA (5#/A), and water were applied to weed free, replicated plots. Plots were watered heavily every two weeks until the time of evaluation on October 15. Application of Simazin resulted in 100 per cent control of such weeds as Stellaria and Capsella, while the application of CDAA resulted in 80 per cent weed control. No injury to the plant material was observed as the result of the application of CDAA. Simazin caused complete defoliation with the exception of the terminal whorl of leaves which were mottled and chlorotic. (Department of Horticulture, Iowa Agricultural Experiment Station, Ames, Iowa.)

Control of Brush on Rangeland and Pastures

Harry M. Elwell

Summary

Abstracts received were of work in Texas and Oklahoma. The reports were from studies of effect of various herbicides; on native grass and weeds, the control of sand shinnery oak and mesquite, yucca control and chemical change of oak leaves. Seven herbicides being used for brush control and two recommended for weed suppressio were tested as to their effect on yield of little and big bluestem, Indian and switch grass. Ammonium sulfamate at rates for effective brush control, reduced the yield of the grasses. Monuron 80% wettable powder and 25% pellets at 8 pounds of active material per acre reduced grass yields considerably. The greatest effect was on seedling grasses. Fenuron 25% pellets, applied at the same rate, did not reduce the yield of grasses. All of the phenoxy herbicides tested, except for 2,4-D amine, produced good weed control, and for most treatments there was some increase in grass production.

Tests in the spring of 1953 and 1954 with aerially applied low volatile esters of 2,4-D, 2-(2,4-DP), 2,4,5-T and 2-(2,4,5-TP) showed the last three herbicides equal and producing 80 to 90 percent control of sand shinnery oak. The rate of acid used for each was one pound per acre for the two consecutive treatments. The native grass present in treated brush was not sampled for yields but there appeared to be a considerable increase.

Studies using .5 pounds acid per acre of low volatile esters of 2,4,5-T or silvex gave effective top control of mesquite growth 4 to 6 feet in height. These herbicides also produced some increased root kill over that obtained from chaining, bulldozing or previous herbicide treatment.

A single aerial application of low volatile esters of either 2,4,5-T or silvex at 1.3 pounds of acid per acre produced better than 50 percent kill of yucca. The silvex was slightly more effective. There was very little difference in kill of yucca on sandy or sandy loam soil.

The leaves of oak plants aerially treated with 2,4,5-T and 2(2,4,5-TP) were analyzed for effect on change in soluble sugar, alcohol soluble solids and alcohol soluble nitrogen. A survey of the chemical data for the leaves shows several inconsistencies. However, the overall trends indicate the following: (1) a reduction in soluble sugar over the period sampled of from 30 to 40%; (2) a slight reduction in alcohol soluble solids approximating 10 per cent; and (3) a sizeable increase in alcohol soluble nitrogen in the post oak and some increase in black oak.

Abstracts

Effect of various herbicides on native grass and weeds. Elwell, Harry M. A number of herbicides were applied on mixed stands of big and little bluestem, Indian and switch grass meadow. The weeds were white aster, annual broomweed, wild carrot, crotons, horse nettle, plantain and western ragweed. The effect of various rates and kinds of herbicides on grass yields and weeds is shown in the following table:

Herbicide			Pounds dry forage/acre[2/] (Fall 1957)		Percent of check	
Kind	Date applied	Pounds[1/] acre	Grass	Weeds	Grass	Weeds
Check	1956	--	1412	612	--	--
Check	1957	--	1200	30	--	--
Ammonium sulfamate	1957	40*	1261	28	105	93
Ammonium sulfamate	1956	50	1262	1017	89	166
Ammonium sulfamate	1957	75	1305	116	109	387
Ammonium sulfamate	1956	100	1260	1262	89	206
Ammonium sulfamate	1957	150	1030	0	85	0
2,3,6-trichlorobenzoic	1957	5	1428	15	119	50
2,3,6-trichlorobenzoic	1957	7	1420	0	118	0
2,3,6-trichlorobenzoic	1957	9	1370	0	114	0
2,4,5-T low volatile ester	1956	2	1570	497	111	81
2,4,5-T low volatile ester	1957	2	905	0	75	0
2(2,4,5-TP) low volatile ester	1957	2	1040	0	87	0
2(2,4-DP) low volatile ester	1957	2	1580	0	132	0
2,4-D volatile ester	1957	1.0	1580	0	132	0
2,4-D amine salt	1957	1.5	1860	145	155	179
Check for Monuron & Fenuron	1956	--	1576	583	--	--
Monuron (80% W.P.)	1956	4**	1726	600	110	103
Monuron (80% W.P.)	1956	6**	1813	816	115	140
Monuron (80% W.P.)	1956	8**	1250	736	79	126
Monuron (25% Pellets)	1956	8**	1486	420	94	72
Fenuron (25% Pellets)	1956	8**	1842	580	117	99

1/ Monuron and fenuron pellets broadcast; other materials each applied in 40 gallons water per acre. Applications made in May of each year. Treatments made in 1956 not retreated.

2/ Average from either 2, 3, or 4 replications.

* Applied in 1:4 diesel oil-water emulsion; others in water.

** Pounds of active material.

The average for all treatments with ammonium sulfamate showed a decrease of native grass and some reduction of weeds. There was considerable reduction of native grasses from 8 lbs. per acre of monuron (80% wettable powder and 25% pelleted material). This was most noticeable on the seedling grass plants. Fenuron at 8 lbs. per acre did not reduce the yield of grass and had only slight effect on weed suppression. All of the phenoxy herbicides except the 2,4-D amine produced good weed control, and for most treatments there was some increase in production of native grasses. (Crops Research Division, ARS, U. S. Department of Agriculture and the Oklahoma Agricultural Experiment Station, Stillwater, Oklahoma.)

Aerial application of chemicals for control of sand shinnery oak, effects on grass recovery and forage production. Meadors, Cecil H. Jr., Fisher, C. E. and Robison, E. D. Experimental aerial application of low volatile esters of 2,4-D, 2-(2,4-DP), 2,4,5-T and 2-(2,4,5-TP) were made at two locations on sand shinnery oak in the spring of 1953 and 1954. The herbicides were applied at rates of 1/2 and 1 pound active ingredient per acre in diesel oil and 1:3 oil-water emulsion carriers using 4 gallons total volume per acre.

The tests were designed to evaluate consecutive spraying of herbicides for control of sand shinnery oak and to determine effects of these treatments on grass recovery and forage production. In addition to retreatments, new materials have been applied on 5-acre plots each year in an attempt to find a chemical that might be cheaper, more effective or less hazardous to use near cotton or areas where susceptible plants occur.

Results of repeated treatments based on observations of two consecutive sprayings show 80 to 90 percent control of sand shinnery oak with 1 pound of 2,4,5-T, 2-(2,4-DP) or 2-(2,4,5-TP) in 1 gallon of diesel oil and 3 gallons of water per acre. Comparable results were obtained from three consecutive sprayings with these chemicals at a rate of 1/2 pound per acre.

The production of grass appeared to be greatly improved in treated areas when compared to untreated shinnery. Exclosures to prevent grazing of treated and untreated areas were fenced in 1956, however, evaluations to determine grass recovery and forage production are not complete at this time. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas.) Approved as Technical Article No. 2723

Retreatment of mesquite regrowth by aerial application. Meadors, C. H. Jr., Fisher, C. E., Robison, E. D. and Behrens, R. Aerial application retreatment of mesquite previously treated by chaining, bulldozing, aerial spraying or other methods have been made since 1952. Mesquite regrowth from 24 to 60 inches in height was treated using available commercial formulations of low volatile esters of 2,4,5-T and silvex at rates varying from 1/4 to 1 pound acid equivalent per acre. These tests indicate aerial retreatment applied when regrowth becomes bothersome, 4 to 6 feet in height, will kill most of the top growth to ground level and will result in some increase in root kill over that of the original treatment. At the present time 2,4,5-T and silvex applied at the rate of 1/2 pound acid equivalent in an emulsion containing 1 gallon of diesel oil and 3 gallons of water per acre is considered necessary for the control of regrowth. However, tests are under way to determine whether the application rate might be reduced to 1/3 pound of herbicide per acre in 3 gallons of emulsion carrier; the same treatment that is now recommended for control of original growth of mesquite. (Contribution of Texas Agricultural Experiment Station, Spur, Texas and the Crops Research Division, A.R.S., U.S.D.A.) Tech. Art.2780

Aerial application of 2,4,5-T and silvex for the control of yucca. Meadors, C. H. Jr., Fisher, C. E., Robison, E. D. and Kirkland, James H. Aerial application of low volatile esters of 2,4,5-T and silvex for the control of dense stands of yucca were initiated in June, 1956. Observations made in sand shinnery oak plots treated with 2,4,5-T and silvex in 1953 and 1954 showed a high percentage kill of yucca and led to the expanded studies on different soil types in 1956.

The herbicides were applied to yucca using rates of 1/3, 2/3 and 1 1/3 pound acid equivalent per acre in diesel oil and 1:3 oil-water emulsion carriers at 4 gallons per acre. Evaluations one year after treatment are shown in the following table:

Rate Lbs. A.E./A	Carrier	Percentage kill			
		2,4,5-T*		Silvex*	
		Sand	Sandy loam	Sand	Sandy loam
1/3	Diesel oil	32	33	42	43
2/3	Diesel oil	42	44	48	61
1 1/3	Diesel oil	58	55	64	60
2/3	Emulsion	31	48	46	61

* Propylene glycol butyl ether esters of 2,4,5-T and silvex. (Contribution of the Texas Agricultural Experiment Station, Spur, Texas and Agricultural Chemical Division of Dow Chemical Company.) Approved as Technical Article No. 2781

Chemical analysis of oak leaves treated with 2,4,5-T and 2(2,4,5-TP). Webster, James E. and Elwell, Harry M. Leaf samples were taken from small, medium and large post and blackjack oaks, which had been treated with 2,4,5-T and 2(2,4,5-TP). The low volatile ester of each herbicide was aerially applied at 1.8 pounds of acid per acre on May 28, 1957. The plants were in full leaf and growing very rapidly due to excessive soil moisture and favorable temperature conditions. Samples were taken from five marked plants for each size of treated and adjacent untreated tree and brush. The sampling periods were just prior to the application, 24, 72, 144, 212 and 572 hours after the treatment. All analyses were made in accordance with standard procedures. A survey of the chemical data for the leaves shows several inconsistencies at specific dates; however, the overall trends indicate the following: (1) a reduction in soluble sugar over the period sampled of from 30 to 40%; (2) a slight reduction in alcohol soluble solids approximating 10 per cent; and (3) a sizeable increase in alcohol soluble nitrogen in the post oak and some increase in black oak. (Contribution from Biochemistry and Agronomy Departments, Oklahoma Agricultural Experiment Station and Crops Research Division, A.R.S., U.S. Department of Agriculture, Stillwater, Oklahoma.)

Chemical Drying and Pre-Harvest Weed Control

N. E. Shafer

Summary

Only two abstracts were received both on chemical desiccation of grain sorghum. On a seed production field 6 qts.of PCP in 5 gal of No. 2 diesel fuel gave best drying. In another trial ten different sorghum hybrids and three common varieties showed a varying response to nine different chemical treatments. Redbine 60, Martin, RS 650, Midland, RS 590, and De Kalb D-50 showed greatest response to chemical treatment. Texas 620 showed no response to chemical treatment. This variety x chemical interaction should help explain some poor results reported by some investigators in previous years.

Abstracts

A comparison of chemical desiccants for field drying a hybrid sorghum seed field. Shafer, N. E. One acre blocks of female seed production rows of male sterile Combine 60 (MS 385) were treated by airplane when the moisture content of the grain ranged from 36 to 42%. Treatments were made on September 30 during a period of clear weather with daily highs of 80°F. First moisture samples were taken October 4th. Cloudy weather with rain and cold temperatures began October 7 and persisted intermittently for the following 3 weeks. A final moisture sample was taken October 29. The first freeze of the season occurred on October 25, 26 and 27th; however, some green tissue was apparent on untreated plants at the time of the last sample. Moisture samples were obtained by hand stripping one pedicel branch from each of 40 to 45 ... randomly selected heads in each treatment plot. Samples were dried to a uniform dryness in an electric oven at 104°C. Treatment information and moisture results are summarized in the following table:

Chemical treatment	Rate/A	Volume and Carrier	Moisture percentage October 4	Moisture percentage October 29
Uran 28	30 lb N	10 gal water 1/	37.98	-----
Ammonium nitrate	30 lb N	15 gal water	36.84	23.61
Magnesium chlorate (DeFOLate)	20 lb	5 gal water	30.78	21.97
Magnesium chlorate (Magron)	6 qts	5 gal water	32.36	21.47
PCP	4 qts	5 gal No. 2 diesel	30.23	20.64
PCP	6 qts	5 gal No. 2 diesel	28.98	19.14
DNBP (Dow General)	3 pts	5 gal No. 2 diesel	31.31	22.24
DEF (Chemagro)	4 qts	5 gal No. 2 diesel	31.68	23.09
DEF (Chemagro)	6 qts	5 gal No. 2 diesel	35.06	23.89
Check	6 qts	5 gal No. 2 diesel	37.33	27.72

1/ Dynawet added to give 0.1% v/v wetting agent in all water treatments.

(Contribution of the Agronomy Department, University of Nebraska, Lincoln, Nebraska.)

Response of several grain sorghum hybrids and varieties to chemical desiccants. Shafer, N. E. Three grain sorghum varieties and ten hybrids were sprayed by airplane using nine different chemical treatments. Chemicals and rates used were S,S,S-Tributyl phosphorotrithioate ("DEF" Chemagro) 4 and 6 lbs, PCP 6 qts, magnesium chlorate (Magron) 6 qts, magnesium chlorate ("DeFOLate") 20 lbs, Endothal (Harvest Aid Defoliant) 3 gal, Endothal (Disodium) 4 qts, ammonium nitrate solution 15 gal @ 2 lb N per gal, Uran 28 10 gal @ 3 lb N per gal. A 5 gal per A volume was used for all treatments

except the nitrogen solutions. "DEF" and PCP were applied in 5 gal of No. 2 diesel fuel per acre. All plots were sprayed September 26, and moisture samples were taken 7 days later.

Variety or hybrid	Best Chemical	Moisture	Untreated	Av. moisture all chemicals
Redbine 60	6 qts "DEF"	15.67	27.66	19.03
Martin	6 qts "DEF"	18.62	28.69	20.67
RS 650	6 qts "Magron"	19.97	28.55	23.33
Midland	6 qts "DEF" or 6 qts PCP	15.10	21.81	17.10
RS 590	20 lb "DeFOLate"	17.64	24.92	21.21
Texas 620	6 qts "DEF"	21.31	22.77	22.81
RS 610	6 qts "Magron"	18.22	21.17	19.45
RS 501	6 qts "DEF"	13.44	16.37	15.51
Texas 660	6 qts "Magron"	22.35	27.14	25.26
Experimental #41	6 qts PCP	15.72	17.89	18.38
Experimental #36	6 qts PCP	14.19	19.02	15.76
Experimental #39	6 qts PCP	18.54	23.94	20.05
De Kalb D-50	6 qts PCP	18.63	30.65	21.35

Considerable variation in moisture content occurred between the various hybrids and varieties showing that some lines maintain a distinctly higher seed moisture than others. Redbine 60, Martin, RS 650, Midland, RS 590 and De Kalb D-50 showed greatest response with moisture losses ranging from 6.5 to 12% compared to untreated. Texas 620 showed practically no response to chemical treatment. PCP gave the lowest average moisture percentage across all varieties but was only slightly lower than that obtained with the magnesium chlorate formulations or with 6 qts of "DEF". (Contribution of the Agronomy Department, University of Nebraska, Lincoln, Nebraska.)

NEW HERBICIDES

SUMMARY

J. H. Davidson

Contributors to the 1957 Research Report of the North Central Weed Control Conference received a communication dated September 16, 1957 from the Chairman and Vice Chairman of the Research Committee containing instructions for submitting abstracts on new herbicides. For the purpose of this summary, only those compounds not listed on Pages 280 and 281 of Weeds IV (No. 3), July 1956, are considered new herbicides.

A few of the abstracts submitted were not used because the compounds listed did not qualify as new herbicides under the above directive as issued this year.

This summary is based on 45 abstracts, in which results from 13 new herbicides were recorded. It is difficult to adequately interpret the information given in these abstracts due to the variable conditions under which the tests were conducted. For further information on the products listed, it is suggested that the reader refer to the crop or weed section concerned where the full abstract will appear.

Ethyl N,N-di-n-propylthiolcarbamate (EPTC) (34 reports) worked into the soil as a pre-emergence treatment at rates of 2 to 8 lbs. per acre appeared promising for the control of such grasses as green foxtail, wild oats, Johnson grass seedlings and others. Pre-emergence treatments for broadleaf weed control were less satisfactory. Although some injury was reported to certain vegetable and agronomic crops, its use in peas, sugar beets and asparagus may be possible. Variability in effectiveness may be attributed to soil moisture content. One report indicated excellent weed control where application was made on dry soil and poor control on wet soil.

2-Chloro-4,6-bis (ethylamino)-s-triazine (Simazin) (22 reports) applied as a pre-emergence treatment at 2 and 4 lbs. per acre on corn generally resulted in excellent weed control with no injury. Johnson grass seedlings were not controlled in one report. Good control of wild oats, setaria, rough pigweed and wild mustard can be expected. Dandelion and Canada thistle were reported to be resistant. Most crops appear to be injured by rates required to give satisfactory weed control. Muckland grown onions may be somewhat tolerant.

Post-emergence treatments were generally not satisfactory.

2-Chloro-4-ethylamino-6-diethylamino-s-triazine (G-27931) (14 reports) was applied as a pre-emergence spray at 1.5 to 6 lbs. per acre. Most of the reports covered tests in vegetable plantings. Some crop tolerance to this material was reported but weed control was generally poorer than reported for Simazin. Over-all post-emergence sprays of 2 lbs. per acre on sweet potato and tomato transplants resulted in good yields with no damage reported (one report).

2-Chloro-4-diethylamino-6-isopropylamino-s-triazine (G-30031) (9 reports) was applied at 1.5 to 6 lbs. per acre as a pre-emergence spray. Most of the reports covered tests in vegetable plantings. Crop tolerance appeared similar to Simazin and weed control was generally poorer. Over-all post-emergence sprays on snap beans and tomato transplants caused damage (one report).

2-Chloro-4,6-bis(isopropylamino)-s-triazine (G-30028) (5 reports) was applied at 1 and 2 lbs. per acre as a pre-emergence spray on corn with good control of most seedling grasses and broadleaved weeds. On peas it caused injury. Applied as an over-all post-emergence spray on snap beans, it caused injury but on tomatoes it appeared promising (one report).

2-Chloro-4,6-bis (diethylamino)-s-triazine (CDT) (2 reports) was applied as a pre-emergence spray for peas and corn. Weed control was poorer than with Simazin.

1,2,4,5-Tetrachlorobenzene (15 reports) was used at rates of 2.5 to 10 pounds per acre in fall or spring pre-planting treatments worked into the soil with one or more diskings. Treatments were primarily for wild oat control which ranged from 50 to 100%. Damage to crops was variable depending upon application rate, soil conditions and interval between treatment and planting. Most crops planted in treated soil can be injured, but corn, sunflowers, peas and soybeans are tolerant. Sugar beets and flax show some tolerance. Small grains are sensitive. Two reports indicated 50% control of horsetail. Control of green foxtail was poor.

Tris-(2,4-dichlorophenoxyethyl) Phosphite (3Y9) (3 reports) was applied as a pre-emergence spray at rates ranging from 1 to 8 lbs. per acre. At rates higher than 5 lbs., it was injurious to corn and delayed maturity of peas. At 8 lbs. it gave good control of wild oats but injured crops following the treatment.

Sodium methyldithiocarbamate (Vapam) (2 reports) was applied at 5 and 8 lbs. per acre as a pre-planting treatment for weed control in vegetables. Weed control was fair, and no injury to grain and vegetable crops planted in treated soil was noted.

3,4-Dimethyl benzophenone (3,4-DMB) (12 reports) was used at the rate of 6 to 12 lbs. per acre. As a pre-emergence treatment, it gave 80 to 98% control of millet and pigweed in corn. Control of wild oats, barnyard grass and green foxtail was poor at 12 lbs. per acre.

Alpha chloro-n-ethyl-n-phenyl acetamide (CP 6936) (8 reports) was used at 4 to 6 lbs. per acre as a pre-emergence treatment. Control of millet and pigweed ranged from 73 to 95%. Control of weeds in muckland onions and potatoes was satisfactory at the 6 lb. rate, as was weed control in canning peas. Muckland carrots were injured.

3,5-Dimethyltetrahydro-1,3,5,2H thiadiazine-2-thione (Mylone) (1 report) was used at the rate of 185 lbs. to 370 lbs. per acre as a pre-planting treatment for tobacco. Fall and spring treatments were made. Where soil was prepared in the fall and treated in either the spring or fall, 85 to 90% control of weeds was obtained. Soil treatments made on spring prepared soil gave poor weed control.

Sodium 2,3-dichloroisobutyrate (FW-450) (2 reports) was used at 4 lbs. per acre as a post-emergence spray for crabgrass in bluegrass turf with promising results. A pre-emergence treatment for grass control in peas was not satisfactory.

Mechanical Considerations

W. G. Lovely

Summary

Abstracts were received from Iowa and Minnesota in the United States and Saskatchewan and Saskatoon in Canada.

Spraying Equipment: Studies on the use of fluorescent chemicals to measure spray deposits indicate an accuracy in the order of plus or minus 5% in field trials. Liljedahl and Strait found that powder suspensions of the fluorescent chemicals were most successful. Studies were conducted by Liljedahl and Strait on the use of narrow angled nozzles on the ends of the spray boom and a wheel-driven pump to apply latex paint at 15-20 ft. intervals along the swath. This system of marking swaths looks promising but needs further refinement and testing.

Weed Control Methods and Equipment in Crops. In studies to determine the relationship between the volume of soil disturbed by the rotary hoe and the percentage weed kill obtained, Liljedahl, Strait, and Fiedler found that the equation X (percent weed kill) $= 2092\ V$ (soil volume)$^{\frac{1}{2}}$ to be accurate to plus or minus 10% at the 95% confidence level. In studies of early shallow cultivations for controlling weeds in corn, Lovely shows that the timely use of the weeder and rotary hoe improves weed control. Where the weeder was used, it was possible to reduce the number of follow-up cultivations. However, the weeder tended to reduce stands and yield. In studies on cultural control of green foxtail in wheat reported in the Annual and Winter Annual Grass Weeds section, Keys shows that harrowing after the wheat was up gave better control than pre-emergence treatments using the rod-weeder or the harrow in the period 1955-1957. In studies on substitutes for first cultivation in corn in 1956, Liljedahl and Strait show that 6 lb/A CDAA pre-emergence, 4 lb/A DNBP post emergence, 1½ lb/A 2,4-D pre-emergence, cultipacking and rotary hoeing post emergence, rotary hoeing post emergence, and harrowing post emergence gave higher yields than the conventionally cultivated check. However, the yield differences were large enough for significance at the 5% level only between CDAA and the check; and between cultipacking plus rotary hoeing and the check. In similar studies Lovely shows that pre-emergence applications of Simazin 3 lb/A and using the weeder at the 1-2 and 4-6 leaf stage required only a lay-by cultivation for excellent weed control. Also that pre-emergence applications of CDAA 4 lb/A, 2,4-D ester 2 lb/A and rotary hoeing at 1-2 and 4-6 leaf stage required two cultivations and that pre-emergence applications of 2,4-D amine 2 lb/A required three cultivations. This abstract also shows that strip applications were nearly as effective as overall applications. Studies on summer fallowing by Shelleck, White, and Gerrie reported in the Annual, Winter Annual, and Biennial Broad-leaved Weeds section show that disking 3 times during the summer, 2 applications of 2,4-D and Dalapon, 1 disking plus 2 applications of 2,4-D and Dalapon, 1 disking plus 1 application of 2,4-D and Dalapon followed by a late disking, 3 applications of ATA and disking plus 2 applications of ATA gave adequate weed control. In studies on methods of controlling regrowth of leafy spurge reported in Leafy Spurge and Russian Knapweed section, Shelleck shows that six applications of 2,4-D at rates from 6 oz/A to 8 lb/A and six applications of ATA at rates from 3.2 lb/A to 20 lb/A followed by a disking each time were required for control of leafy spurge regrowth.

Abstracts

Measurement of Spray Deposits by the Use of Fluorescent Chemicals. Liljedahl, L. A., and Strait, John. A method has been proposed and tested for the

rapid determination of the spray distribution from sprayers. A fluorescent chemical is mixed with the spray, and a sample of the sprayer distribution is collected on a strip of paper laid across the sprayer swath. The paper strip is then drawn through equipment which illuminates it with ultraviolet light and scans it with a photo-electric cell. The photocurrent is amplified and fed to a strip chart recording milliammeter, which indicates the relative distribution of chemicals across the swath. It was found that the greater the droplet size of the deposited chemical, the less was the fluorescence per unit of chemical. The laboratory tests indicated that the method should be accurate within plus or minus 1%, but field tests so far show the accuracy to be of the order of plus or minus 4-5%. Of 26 fluorescent chemicals tested for this purpose, only Lumogen L Light Yellow yielded a linear and consistent relationship between amount deposited and total fluorescence. Since this was the only chemical tested which was used as a suspension of a powder, it is possible that other chemicals would be satisfactory if used as a powder suspension rather than as a solution. (Contributed by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Minnesota Agricultural Experiment Station.) (Paper No. 3854, Scientific Journal Series, Minn. Agr. Exp. Sta.)

A Method of Marking Sprayer Swaths. Liljedahl, L. A., and Strait, John. Preliminary tests were conducted late in the summer of 1956 on a swath marking system consisting of narrow angle nozzles mounted on the ends of the sprayer boom, which are connected by means of $\frac{1}{4}$" nylon tubing, to an automotive fuel pump mounted on the rear tractor axle housing and actuated by an impulse cam on the tractor axle. Thus, each time the rear wheel revolves (every 15-20 ft.), the pump forces a certain amount of marker liquid through a nozzle at the boom tip. Replacement of the spring in the pump with one which would yield approximately 10 p.s.i. produced a satisfactory spray through a nozzle with a 0.03 in. diameter orifice. The marking material deposited was much more visible when the nozzles were pointed in at an angle toward the center of the sprayer, so that the deposit was placed on the side of the foliage visible from the adjoining swath.

A marking material composed of one part white or light yellow latex paint to five parts of water appeared to leave an adequately visible mark. However, the latex paint left some deposits in the equipment. While the equipment described shows some promise as a swath marking method, further testing is needed to determine whether or not it is practical. (Contributed by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Minnesota Agricultural Experiment Station.) (Paper No. 3852, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Relationship Between the Percentage Weed Kill Obtained with a Rotary Hoe and the Volume of Soil Disturbed. Liljedahl, L. A., Strait, John, and Fiedler, B. H. In 1957 tests were conducted to determine the relationship between the percentage weed kill obtained with a rotary hoe and the volume of soil disturbed by the rotary hoe. Four 8' x 10' plots were prepared by tilling, leveling, and rolling to produce a bulk density of approximately 1.1. The soil was sandy clay loam. A mixture of weed seeds, consisting primarily of rough pigweed, wild mustard, and Setaria spp., were seeded on the surface and rolled in. When weed seedlings emerged, the plots were rotary hoed at depths of 3/4", 1 1/4", 1 3/4", 2 1/4", and 2 3/4", using three different types of rotary hoes. Weed counts were taken one day before and four days after rotary hoeing to determine weed kill. The volume of soil disturbed was measured by weighing all loose soil removed with a vacuum cleaner from a strip 3" wide and 36" long over the path of one hoe wheel.

Based upon 36 pairs of measurements, the relationship between the weed kill and the volume of soil disturbed is expressed by the equation $K = 2092\ V^{\frac{1}{2}}$, where: K = kill of seedlings in percent, and V = volume of soil, in cubic inches, removed from a 3" x 36" strip, converted to the original dry bulk density, and within the range of 0 to 15.4 cubic inches. The equation was found to be accurate to plus or minus 10% at the 95% confidence level. (Contributed by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Minnesota Agricultural Experiment Station.) Paper No. 3841, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Comparisons of Some Shallow Cultivating Tools Used to Control Weeds in Corn. Lovely, W. G. Seedbeds were prepared by spring plowing, disking three times with a tandem disk, and spike-tooth harrowing. Corn was planted with a two-row planter on May 22. Half the plots were harrowed directly after planting. The rotary hoe, weeder, and conventional cultivator were used on plots that received three normal cultivations and on plots that received only the normal second and lay-by cultivation.

Sample weed weights taken in September indicate the following:

1. Using the weeder when the corn was at the 2-3 leaf stage and at the 4-6 leaf stage followed by 2 or 3 cultivations gave better weed control than when the corn was cultivated in the normal way. This indicates that the weeder could be used as a substitute for the first cultivation.

2. Using the rotary hoe at the same time as the weeder followed by 2 or 3 cultivations improved the weed control over the check that was cultivated 3 times only slightly. However, when compared to the plot that received only two cultivations, the rotary hoe showed significantly better weed control. This indicates that the rotary hoe improves weed control but not enough to substitute for the first cultivation.

Stands were slightly reduced by 3 cultivations as compared to 2 cultivations, and using the weeder caused a marked reduction in stand as compared to other treatments. Yields were not materially affected, but where the weeder was used, the yields tended to be lower than the others. Harrowing after planting had no apparent effect on weed control, stand, or yield.

In general, the results indicate that shallow cultivating tools such as weeders and rotary hoes used at the proper time improve weed control, and although the weeder tends to reduce stands and yields it gives better control than the rotary hoe. (Contribution by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Iowa Agricultural Experiment Station.)

Comparison of Some Substitutes for the First Cultivation in Corn. Liljedahl, L. A., and Strait, John. In 1956 1/30 acre plots of corn were given various treatments which might be substituted for the first cultivation. These treatments were followed by two cultivations with conventional cultivating equipment. Yields were as follows:

Treatment	Yield, bu./A.
6 #/A CDAA pre-emergence spray	114.2
Cultipacked and rotary hoed as first weeds emerged	107.1
Rotary hoed as first weeds emerged and again one week later	101.3
4 #/A DNBP post emergence spray at spike or coleoptile stage	100.5
1½ #/A 2,4-D pre-emergence spray	98.3
Spike tooth harrowing as first weeds emerged	71.9
Check - conventional cultivation	68.7

Differences were significant at the 5% level by analysis of variance. The Student-Newman-Keel test showed the smallest significant difference to be 26.6 bu./A. Thus the CDAA pre-emergence treatment and the cultipacker followed by a rotary hoe gave higher yields than the check, while all others gave yields equally as good as the check treatment. (Contributed by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Minnesota Agricultural Experiment Station.) (Paper No. 3853, Scientific Journal Series, Minn. Agr. Exp. Sta.)

Comparisons of Pre-Emergence Herbicides and Shallow Cultivations for Controlling Weeds in Corn. Lovely, W. G. Corn was planted with a 4-row planter on May 22 on ground that had been plowed, disked, and harrowed. Strip and overall applications of Simazin - 3 lb/A, CDAA - 4 lb/A, 2,4-D ester - 2 lb/A, and 2,4-D amine were made at planting time. The rotary hoe and the weeder were used on check plots on June 4 and 12. As the weed growth indicated the need, each plot was cultivated with a conventional sweep-type cultivator.

Cultivations required for each treatment were:

Pre-Emergence and Shallow Cultivations		Cultivations		
		June 23	June 29	July 6
Simazin 3 lb/A -	strip		X	X
	overall			X
CDAA 4 lb/A -	strip		X	X
	overall		X	X
2,4-D ester 2 lb/A -	strip	X		X
	overall	X		X
2,4-D amine 2 lb/A -	strip	X	X	X
	overall	X	X	X
Rotary Hoe June 4 and 12			X	X
Weeder June 4 and 12				X

The weed weight samples taken by harvesting four 6-foot samples from each plot show that none of the treatments averaged more than 400 pounds of dry matter per acre, which is excellent control. The data indicate that overall applications were slightly better than strip applications.

Stands which ranged from 12,640 to 13,500/A were not materially affected by the treatments; however, lowest stands were obtained where the weeder was used. Yield differences ranged from 92 to 100 bu/A, and the weeder and Simazin treatments were lowest. (Contribution by Agricultural Engineering Research Division, A.R.S., U.S.D.A., and Agricultural Engineering Department, Iowa Agricultural Experiment Station.)

BASIC STUDIES

Summary

W.E. Loomis

Problems of the maturation, dormancy and germination of weed seeds are receiving some of the needed attention. Although the vegetative reproduction of such plants as Canada thistle and quack grass seems more spectacular, seeds, are responsible for most of our weed troubles, both in terms of distribution and persistence. Preemergence herbicides which act more or less specifically on very young seedlings offer especial promise for weed control in many crop plants.

Chemical treatments that upset the normal dormancy of perennial plants offer real contributions to cultural control. The development of low-cost chemical treatments to break the dormancy of weed seeds in the soil is a future possibility that would be of value under many conditions.

The apparent discovery of a mechanism of growth in epidermal cells is a basic contribution from a study planned to determine the role of leaf surfaces in the penetration and absorption of herbicidal sprays.

Abstracts

Extension of the range of Johnson grass into Michigan. Grigsby, B.H. Infestations of Johnson grass were found, in 1957, in three of the south-western counties of Michigan. These counties are: Cass, Van Buren, and Berrien. The known age of the infestations ranges from 3 to 10 years but positive identification was not made until this year. At each location growth has been slow but steady and the patches now range in size from ½ to 10 acres. Propagation appears to have been by means of both seeds and rhizomes. Studies are now under way to try to determine whether a cold resistant variety has become established or whether climatic factors and soil conditions have been responsible for survival of Johnson grass outside the normal range for this plant. (Michigan Agricultural Experiment Station)

Growth of Johnsongrass rhizome buds. Ingle, M., and Rogers, B.J. Johnson-grass (Sorghum halepense) rhizomes were collected from the field and cut into one-node sections. Only nodes bearing differentiated buds were utilized. After cleaning and surface sterilization, the segments were placed in Erlenmeyer flasks which contained sterile moist vermiculite. These flasks were then placed under conditions of controlled temperature and photoperiod. The number, length, and dry weight of shoots were determined after 14 days. Maximum sprouting occurred in continuous darkness and increased with temperature. At 60°F, sprouting was generally less than 25%, while at 90°F sprouting was over 80%. At any given temperature, sprouting decreased as the photoperiod was lengthened. Alternating temperatures (60°-80°F) for various periods gave sprouting slightly below that obtained in constant 80°F. Statistical analysis indicated that there was no interaction between temperature and photoperiod. Dry weight per shoot rose with increased temperature and photoperiod. The effect of chemicals was examined by soaking the segments in solutions before planting. Under these conditions, ATA at 5×10^{-2}M was completely inhibitory. ATA at 10^{-2}M caused severe chlorosis as well as depressed growth. Dalapon (sodium salt) at 5×10^{-2}M stopped bud development, while at 3×10^{-3}M sprouting and growth were severely restricted. The effects of this chemical under these conditions were identical in the light and in the dark. MH (sodium salt) was completely inhibitory at 4×10^{-2}M, but not effective at 1×10^{-2}M. (Dept. of Botany and Plant Path., Purdue University Agric. Expt. Sta., Lafayette, Indiana.)

The lateral spread and density of different morphological strains of the three species of hoary cress. Sexsmith, J.J. Collections of various morphologically

different strains of hoary cress were made in the fall of 1956, and 16 clones of each were transplanted from 2" pots to the field on April 18, 1957. As a preliminary phase of an intended study of the reaction of the strains to chemical treatment, measurements of lateral spread and estimates of stand density were taken on September 26, 1957. Results: A summary of the measurements and density ratings is given in the following table, based on all 16 clones in each strain.

	Heart-podded *C. Draba*	Lens-podded *C. Draba* var. *repens*	Globe-podded *C. pubescens* var. *elongata*
No. of strains	5	12	2
Lateral spread - Range	8'9"-15'2"	7'10"-14'0"	8'8"-9'4"
Average	13'1"	11'11"	9'0"
Density (1-5) - Range	1.4-3.9	1.4-3.3	1.5-1.6
Average	2.9	2.0	1.6

From the limited number of strains available, the indications are that, of the three varieties of hoary cress, the heart-podded is the most aggressive and forms a more dense infestation than do either of the others, and that globe-podded hoary cress is the least aggressive. (Canada Dept. of Agriculture, Experimental Farm, Lethbridge, Alberta.)

Seed maturation study of perennial sow thistle. Schultz, R.E., Derscheid, Lyle A. and Zilke, S. On July 16, 1956 all flowers were removed from a patch of perennial sow thistle. On July 17,400 heads that had opened during the intervening 24-hour period were tagged. An additional 700 heads were tagged the following day with red tags. Seventy-five heads were harvested on the 3rd, 6th, 7th, 8th, 9th, 10th and 11th day after they had opened. These heads were dried and 20 heads from each date of harvesting were threshed separately and germinated separately. Three and 6 day old seed was not viable. Seven-day old seed was 20.8% viable; 8 day 76.8%; 9 day 89.0%; 10 day 81.1%; and 11 day 84.3%. These data indicate that by the time perennial sow thistle heads have been open 9 days, a high percentage of viable seed is produced. Plants from the same patch were mowed on the 5th, 6th, 7th, 8th, 9th, 10th and 11th day after the flowers opened. The plants were dried in the field. From 5 to 15 heads were threshed and germinated separately. Five and 6 day old seed was not viable. Seed from 7 day old heads was 0.4% viable; 8 day 3.1%; 9 day 85.6% 10 day 82.6% and 11 day 74.7%. These data indicate that perennial sow thistle plants mowed 8 days or later after the flowers open, produce a high percentage of viable seed. (South Dakota State College, Brookings, South Dakota.)

Seed maturation study of Canada thistle. Schultz, R.E., Derscheid, Lyle A. and Zilke, S. On July 17, 1956 all flowers were removed from a patch of Canada thistle. On July 18, 400 heads that had opened during the intervening 24-hour period were tagged with white tags. Additional 400 newly opened heads were tagged on the following day with red tags and 300 heads were tagged with blue markers on the 3rd day. Fifty heads were harvested on the 6th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th and 19th day after they opened. These heads were dried and twenty heads from each harvesting date were threshed separately and germinated separately. Seeds from 6 day old heads were not viable; 9 day 1.3%; 10 day 12.0%; 11 day 85.2%; 12 day 91.1%; 13 day 84.6%; 14 day 90.7%; 15 day 82.1%; 16 day 89.6% 17 day 89.6%; 18 day 88.0% and 19 day 78.0%. These data indicate that Canada thistle heads contain a high percentage of viable seed 11 days after they have opened. Plants from the same patch of Canada thistle were mowed on the 4th, 5th, 6th, 7th, 8th, 9th, 11th, 12th and 13th day after the heads opened. These plants were dried in the field for 3 days after which they were threshed and germinated separately. From 8 to 20 heads

were used for each date. The 4, 5, 6, 7 and 8 day old heads did not produce viable seed. Seed from 9 day old heads was 4.7% viable; 11 day 94.6%; 12 day 58.6% and 13 day 83.3%. These data indicate that Canada thistle plants mowed 11 days or later after the flowers open, produce a high percentage of viable seed. (Agronomy Dept., South Dakota State College, Brookings, South Dakota.)

Some factors affecting the germination of the seed of vine maple (Acer circinatum). Corns, Wm. G. Vine maple is a weedy tree species of the Pacific coastal forest. Studies under laboratory and outdoor conditions during 1956-57 showed that vine maple seed required a long after-ripening period with low temperature and adequate moisture before growth occurred. Removal of the samara wall hastened germination. Some seeds grew after cold exposure of 3 mos. or less in the lab. when freed from the ovary wall before the germination test, but required 5 mos. or more stratification before sprouting from intact fruit. Some of the seeds with 120 - 140% moisture (basis dry wt.) at harvest time required no additional water for after-ripening at 4°C. in closed jars. Moisture entered air-dry samaras readily through the porous basal tissue, and penetrated the seed coat without difficulty. Breakdown of cementing substance along the fusion line of the ovary wall after prolonged exposure to moisture did not permit germination of unstratified seeds, and a delay in germination during presence of the divided ovary wall on seeds which did have cold moist treatment appears associated with limited oxygen supply to the seed coat. Germination % of stratified, freed seeds was the same whether or not the seed coat was ruptured. Limited tests with seeds treated with 20 ppm. gibberellin soln. indicated that this chemical had no effect on germination of intact samaras but improved the germination of some samples of excised seeds which had been stratified. (Division of Crop Ecology, Univ. of Alberta, and Dept. of Biology and Botany, University of British Columbia.)

Field germination of the seeds of four species of plantains. Steinbauer, G.P., and Buford Grigsby. Seeds of four species of plantains sown at various times during the year indicate considerable variation in time of emergence, correlated with the extent and duration of dormancy. Seeds of the two broad-leaved species, Plantago rugelii and P. major do not germinate readily in the fall of the year in which produced. Seeds of the two linear-leaved plantains, Plantago lanceolata, and P. aristata germinate in the fall when planted soon after harvest. Under natural conditions the seeds of the latter two species may or may not germinate in the year when produced, depending on how long they remain on the parent plant and whether or not weather conditions are favorable for germination in the event they are shed in early fall. Differences in germination patterns of the two groups are related to persistent dormancy in the broad-leaved forms and lack of dormancy in the others (Steinbauer and Grigsby, Proc. Assoc. Off. Seed Anal. 1957, In Press). (Michigan Exp. Station, East Lansing, Michigan).

At study on herbicidal effects of alpha-chloro N,N-diallyl-acetamide (CDAA) and isopropyl N-phenylcarbamate (IPC). Canvin, D.T., and G. Friesen. The reaction of germinating seeds of wild oats, barley, flax and peas to CDAA and IPC treatment was determined. Seeds of the above four species were germinated in petri plates containing various concentrations of either CDAA or IPC. The amount of root growth inhibition, as measured after 96 hours, was used as a measure of phytotoxicity. A 5.7×10^{-6}M solution or higher of CDAA or IPC was very toxic to wild oat and barley seedlings. Flax was resistant to CDAA at intermediate concentrations (5.7×10^{-6}M to 5.7×10^{-5}M) and slightly more resistant to IPC than wild oats and barley. However, the slightly higher resistance of flax to IPC as compared to wild oats would not be sufficient for selectivity. Peas were resistant to CDAA and IPC at even the higher concentrations and selective control of wild oats in peas would seem feasible.

The cytological effects that resulted from CDAA and IPC treatment on barley and peas were also studied. Root tips which had been treated with 5.7×10^{-6}M,

5.7×10^{-5}M, or 5.7×10^{-4}M solutions were collected 96 hours after the start of germination and sectioned on a rotary microtome for cytological examination. In barley roots the primary action of CDAA seemed to be inhibition of cell division; the amount of inhibition being directly proportional to the herbicidal concentration. Only in roots treated with 5.7×10^{-4}M CDAA was the root structure slightly disarranged.

IPC, at the lowest concentration, inhibited cell division in barley roots completely. Root and cell structurea appeared normal, but no dividing cells could be seen. When higher concentrations of IPC were used (5.7×10^{-5}M and 5.7×10^{-4}M) cell structure and root structure were disarranged. Cells in the constricted tips were elongated and narrow, while cells in the swollen region were large and vacuolate. The orderly arrangement of the cells into rows which was apparent in normal barley roots was not apparent here and cell division was completely disarranged. Endopolyploidy was common and many large cells completely filled with chromosomes were observed. These cells were high polyploid and appeared to be in a state of prolonged pseudometaphase. In some of these polyploid cells clumping of the chromosomes could be observed, with the clumps often being unequal in size or stuck together in long chains. This type of polyploidy could only result from repeated division of the chromosomes with no separation taking place. That the spindle mechanism was affected was shown by the presence of tripolar and polypolar anaphases. With the subsequent failure of the cell walls to form, these anaphases resulted in cells containing three or more restitution nuclei. These nuclei were often misshapen and unequal in size. Even when a bipolar anaphase separation occurred the cell wall often failed to form and a cell containing two nuclei resulted. Only in a very few cells did division appear normal.

CDAA appeared to have only a single cytological affect on susceptible species such as barley -- inhibition of cell division. IPC would appear to affect the growth of barley roots in at least two ways. First, at the lower concentration, it hindered cell metabolism to the point where cell division ceased. Secondly, at higher concentrations it directly affected cell division so that division became abnormal.

Pea roots did not show any abnormal effects as a result of the herbicidal concentrations used. This undoubtedly is due to some inherent resistance of peas to CDAA and IPC. (Div. Plant Science, University of Manitoba, Winnipeg).

Preliminary studies on the rate of loss of herbicidal activity of several chemicals applied to the soil. Switzer, Clayton M. and Seaton, O.M. Duplicate 5 x 5 ft. plots were sprayed with several herbicides June 18, 1957 at the rate of 75 gal/A. The soil (Burford loam) was moist following a light rain the day of treatment and was cultivated and raked smooth before application of herbicide. Samples were taken from the top ½ in. in 5 places of each plot, mixed, and placed in 4" clay pots on July 24, Aug. 8 and Aug. 23. Further samples will be tested later this fall and next spring. Millet and turnip seeds were planted in each pot and observations made on subsequent growth. CMU at all rates tested gave complete kill of both turnip and millet within two weeks of their germination. Simazin at all rates killed the turnip seedlings but had little effect on millet. Both the turnip and millet plants grew normally in all other treated soil at all dates.

In addition to the above procedure, weed and grass counts were made at weekly intervals beginning July 24 in a one sq. ft. area (undisturbed by sampling) in the center of each plot. Also the percentage of each plot covered by weeds and grasses was estimated Sept. 5, eleven weeks after treatment. These data are presented below.

Treatment	Rate lb/A	% Ground Cover Total	Weeds	Annual Grasses
2,4,5-T	0.5, 1, 2	72, 73, 50	67, 28, 25	5, 45, 25
2,4-D Amine	0.5, 1, 2	51, 45, 41	38, 43, 14	13, 2, 27
2,4-D Ester	0.5, 1, 2	53, 66, 28	28, 18, 18	25, 48, 10
Simazin	1, 2, 3	0, 0, 0	0, 0, 0	0, 0, 0
FW 450	6,10,15	83, 75, 58	55, 65, 28	28, 10, 30
CIPC	4, 8	31, 11	8, 8	23, 3
EPTC	4,10,15	88, 91, 90	73, 83, 47	15, 8, 43
DN	1, 4, 6	85, 76, 73	60, 58, 65	25, 18, 8
CMU	1, 2, 4	23, 3, 0	23, 3, 0	0, 0, 0
Dalapon	5,10,15	93, 68, 50	90, 63, 45	3, 5, 5
Alanap-3	3, 5,10	11, 9, 5	4, 3, 3	7, 6, 2
Amino Triazole	1, 2, 4	63, 63, 59	33, 30, 14	30, 33, 45
5521	4, 6, 8	48, 33, 18	15, 24, 14	33, 9, 4
Randox	4, 6, 8	58, 68, 60	28, 45, 57	30, 23, 3
Control		93	26	67

The data indicate that CMU and Simazin not only give early inhibition of plant growth but also suppress plants throughout a considerable period - even at relatively low concentrations. Simazin, although it did not kill millet in our greenhouse experiments on the soil samples, did suppress annual grasses in the field. CIPC and Alanap-3 were effective over the whole summer in the field,particularly at the higher concentrations tested. Dalapon, as expected, inhibited grass growth very well with little effect on weeds. The other chemicals tested gave unsatisfactory control of both weeds and grasses. (Dept. Botany, Ontario Agricultural College, Guelph, Canada).

The effect of Brachypterolus pulicarius on toadflax inflorescences, 1957. Selleck, G.W., J.F. Alex, R.I. Coupland and J.M. Smith. Toadflax in Sask. generally produces inflorescences in early July. However, blossoms were almost entirely absent on July 31, 1957 on infestations located within a 30-mile radius from Marsden, Sask., where toadflax was severely infested with the beetle Brachypterolus pulicarius. Shoots which were covered with wire-mesh cages produced normal inflorescences in an infestation otherwise devoid of blossom. Toadflax infestations which were visited in the Rosthern district during the same week were actively flowering and beetles were rare. A second visit to the Marsden district on Sept. 15, revealed toadflax to be in full bloom. It is not known whether blossoming occurred as a result of natural decreased activity of the beetle or whether beetle activity was inhibited by a period of cold weather. Severe beetle attacks result in intense terminal branching of toadflax shoots resembling "witches'-broom", a disease of trees and shrubs. Toadflax inflorescences have also been severely affected by beetles at Saskatoon and Parkbeg. In 1956, much of the toadflax infestation at Parkbeg failed to produce inflorescences all season. (Dept. of Plant Ecology, Univ. of Sask., Saskatoon, with financial assistance from Science Service, Ottawa.)

Biochemical studies of bud dormancy in two deep-rooted perennial weeds, leafy spurge (Euphorbia esula L.) and ironweed (Vernonia baldwini Torr.). Monson, W.G., Haskins, F.A., and Shafer, N.E. Perioxidase and polyphenolase activity of leafy spurge and ironweed bud extracts have been determined at weekly intervals from May through December. Samples were taken from the field, brought to the laboratory, washed free of soil and the buds excised. The buds were macerated in a mortar using 10 ml. of glass distilled water for each gm. of bud material. The resulting slurry

was then centrifuged in a clinical centrifuge and the supernatant used as the enzyme preparation. Perioxidase activity was measured as the change in optical density of the reaction mixture during a five minute period. Guaiacol was used as the substrate. Optical density readings were taken on the Beckman DU spectrophotometer at 460 mmu. Polyphenolase activity was measured in a similar way using catechol as the substrate and measuring the change in optical density at 410 mmu. In both species peroxidase activity of the bud extracts was low in the period during which dormancy was present. Activity of the enzyme increased when the dormancy of the plants had apparently been broken by low temperatures. Polyphenolase activity in leafy spurge was extremely low at all times and it was frequently impossible to get readings that were measurable. Polyphenolase activity of the ironweed bud extracts was very high; however, there was no consistant pattern which could, in any way, be associated with bud dormancy. (Agronomy Dept., Univ. of Nebraska, Lincoln, Nebraska).

Phanological studies of bud dormancy in two deep-rooted perennial weeds. Monson, W.G., Haskins, F.A., and Shafer, N.E. Phenological studies on two species of deep-rooted perennial weeds, leafy spurge (Euphorbia esula L.) and ironweed (Vernonia baldwini Torr.) have been carried on over a two year period. Samples of these two species were taken from the field at weekly intervals starting in May and continuing into the following January. These samples were taken to the greenhouse and transplanted into 6-in. clay pots. The transplants were subsequently observed for the emergence of shoots and for the nature and vigor of the ensuing growth. Results: These studies have shown that nearly 100% emergence occurs from the transplants from May through mid-July. From mid-July through mid-December the number of transplants which emerge is greatly reduced in number and in vigor. During this period the ironweed transplants usually do not emerge; the leafy spurge plants, while emerging, are greatly retarded in their growth. Both of these species when transplanted to the greenhouse after mid-December again show nearly 100% emergence and normal vigor. Soil temperature studies have shown mid-December to be the date at which the soil temperature first reached the freezing point or below in both years. These data indicate that dormancy does occur in both species and that it is broken naturally by low temperatures. (Agronomy Dept., Univ. of Nebraska, Lincoln, Nebraska.)

Effect of gibberellic acid in overcoming bud dormancy in leafy spurge and ironweed. Shafer, N.E., and Monson, W.G. Test plants were grown under greenhouse conditions for a period of three to four months prior to treatment. In one experiment leafy spurge plants were treated using either a 100 ppm aqueous spray or a lanolin paste mixture containing 1% (W/W) gibberellic acid (GA). The spray solution contained 0.17 Tween 20 and all plants were sprayed to the point of runoff. Both paste and spray were applied to (1) exposed crown buds of intact plants, (2) exposed crown buds after removal of topgrowth, (3) overall intact foliage, or placed on shoot tips in case of paste, and (4) exposed cut tips of shoots. Treatments were applied to the intact topgrowth of ironweed. In a second experiment ironweed roots which had failed to produce shoots after several months were treated with 100 and 500 ppm GA as a soil treatment at a rate of 5 ml. per 6 inch pot. Ironweed foliage was treated with 0, 50, 100, and 500 ppm aqueous sprays containing 0.1% Tween 20. Leafy spurge plants received foliage treatments of 0, 25, 50, 100, and 500 ppm GA in 0.1% Tween 20 aqueous solutions. Results: where treatment was made on exposed buds of intact spurge plants both spray and paste resulted in approximately four times the amount of new growth of the control. Treatment of exposed buds following removal of topgrowth resulted in a 4-fold growth response from the paste treatment but little response from the spray. Foliage sprays on intact shoots or on decapitated shoot tips resulted in 4 to 5 times the amount of new growth compared to the check. Similar foliage treatments showed no effect from the lanolin paste. Neither foliage nor soil treatments produced any response in ironweed. Increasing total new shoot growth was observed with increasing concentration of GA. At the end of 3 weeks the 25 and 50 ppm treatments showed approximately 50 cm of new growth,

100 cm from 100 ppm, and over 130 cm from 500 ppm. Gibberellic acid treatment appeared to stimulate or activate quiescent crown buds, caused branching and new shoot production on old shoots and resulted in the emergence of new shoots from buds below the soil surface. (Agronomy Dept., Univ. Nebraska, Lincoln, Nebraska).

The extent and characteristics of root systems of fireweed. Phillips, W.M. and J.L. Launchbaugh. Fireweed (Kochia scoparia), one of the most widespread annual weeds in the Great Plains, is often used as an emergency forage crop during periods of drought. Total precipitation at Hays, Kansas, in 1956 was 9.21 inches and by September 15 it was evident that fireweed was much more drought tolerant than sorghum or native grasses. These studies were undertaken to determine whether physical characteristics of the fireweed root system may, in part, account for the plant's ability to withstand drought. A section of soil, 6 by 12 inches by 6 ft. deep, was removed from a dense stand of fireweed on an upland site and washed, and a section 8 feet deep was taken from a deep alluvial soil. Root penetration exceeded the profile depth in both locations. Maximum vertical root penetration was approximately 10 feet in the upland site and 16 feet in the alluvial soil. Other excavations showed that roots extended laterally as much as 8 feet from plants growing in a scattered stand. Soil moisture samples indicated that the moisture was at or below the permanent wilting percentage to a depth of more than 6 feet wherever there was a dense stand of fireweed. (Crop Research Division, ARS, USDA, and Ft. Hays Branch of Kans. Agr. Expt. Sta.,Hays, Kans.)

Leaf surfaces and herbicide penetration. Schieferstein. R.H. and W.E. Loomis. Studies of leaf surfaces with the double-replica technique indicate that the surface walls of epidermal cells grow by accretion at the margins. Cells of growing leaves showed mature patterns of cuticle and wax in the center of the cells, but narrow zones without either cuticle or wax just above the verticle side walls of the epidermal cells. When wax was wiped from the center of the cells of growing corn leaves there was little or no replacement. Bands or normal wax deposits were produced at the margins of the enlarging cells, however, indicating that these areas were produced subsequent to the treatment. It seems probably that the generally much greater susceptibility of growing plants, to systemic herbicial sprays is due in considerable part to penetration through these uncutinized growth zones. (Department of Botany, Iowa State College, Ames, Iowa)

Miscellaneous

Abstracts

Activity of EPTC as Affected by Soil Moisture at Time of Application. Curtis, R., J. Antognini and H.M. Day, Data from cooperators strongly indicated that soil moisture at time of application of EPTC may be a factor which would cause variability of field results. As a result two greenhouse experiments and one field experiment were conducted to determine the real importance of this factor.

It should be mentioned that prior to undertaking the study on the effect of soil moisture at the time of application a number of other factors had been studied. All of these factors within normal ranges, were found to exert little or no influence on the activity of EPTC.

In the greenhouse tests flats of soil infested with cultivated oat seeds were treated with EPTC at 2½ lbs./acre. Soil moistures at time of application ranged from 1.4% to 32%. Field capanceity of the soil was 15% and saturation 32%. By careful sampling of soil at different levels 24 hours after treatment it was shown that high soil moisture limited the penetration of EPTC vapors. In addition, the results indicated that the soil moisture dividing line between satisfactory and unsatisfactory control was approximately midway between field capacity and saturation.

The field test was conducted on Sorrento loam soil (F.C. = 17%) with EPTC applied to dry soil (5% moisture) and wet soil (near saturation). The test area was sprinkler irrigated 7 days after application. Excellent weed control was obtained where application was made on dry soil and very poor control was obtained on wet soil.

After obtaining the above data a compilation of data received from throughout the country was made to determine the correlation between soil moisture at time of application and weed control. The compilation clearly showed that poor weed control was associated with wet soil at time of application. Undoubtedly, on occasion, poor weed control will be obtained when the soil moisture is ideal at time of application. Since it is known that other factors have a small effect on EPTC activity it is possible that under certain conditions an accumulation of these factors will lead to poor control.